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Bibliography on Frost and Frost Forecasting

l. 4 March, 1953 No. 3

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY is a monthly publication devoted to:

A. Current Abstracts in English on important meteorological literature in every language.

B. Bibliographic references to other items of interest to the profession.

C. Selective, annotated bibliographies on subjects of immediate and special interest to meteorologists.

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 4 MARCH 1953 No. 3

SPECIAL FEATURE IN THIS ISSUE

A Selective Annotated Bibliography on Frost and Frost Forecasting

(For complete table of contents see back cover)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains from 175 to 300 abstracts of current periodical literature and monographs in the fields of meteorology, hydrology, oceanography, etc. These abstracts are arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of from 50 to 250 important references on a special subject without respect to recency of material. No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject. Preference is given to recent material, comprehensive works, material from obscure sources, and items with good bibliographies.

Bibliographies previously published were:

No.	Mo.	Vol. I, 1950	Vol. II, 1951	Vol. III, 1952
1.	Jan.	**Atmospheric Pollution**	**Extended Forecasting**	**Climate—Northwest Africa**
2.	Feb.	**Aerobiology**	**Long Range Forecasting**	**Carbon Dioxide**
3.	March	**Cloud Physics**	**Soil Temperature**	**Climate—Paraguay, Uruguay, Argentina**
4.	April	**Hail**	**Constants, Tables, Diagrams**	**Dew**
5.	May	**Tornadoes**	**Climate—Near East**	**Objective Forecasting**
6.	June	**Volcanic Dust**	**Climate—Middle East**	**Stratus Forecasting**
7.	July	**Climatic Changes**	**Special Winds**	**Urban Climatology**
8.	Aug.	**Thunderstorms**	**Radar Storm Detection**	**Climate—Central Africa**
9.	Sept.	**Icing**	**Condensation Trails**	**Visibility**
10.	Oct.	**Acoustical Propagation**	**Climate—Northeast Africa**	**Glaze and Rime**
11.	Nov.	**Evaporation**	**Mountain Meteorology**	**Free Air Turbulence**

Bibliographies published this year are:

1. **Turbulence Theory,** Vol. IV, No. 1, Jan. 1953
2. **Turbulent Diffusion and Exchange,** Vol. IV, No. 2, Feb. 1953
3. **Frost and Frost Forecasting,** Vol. IV, No. 3, March 1953

Forthcoming bibliographies will be:

4. **Climate of Australasia,** Vol. IV, No. 4, April 1953
5. **Upper Air Winds, 500–100 mb,** Vol. IV, No. 5, May 1953
6. **Upper Air Winds, above 100 mb,** Vol. IV, No. 6, June 1953

Other bibliographies in preparation are:

Actinometers
Arctic Meteorology
Auroral Physics
Climate of Southeast Asia and the East Indies
Climate of the Pacific Ocean Area
Jet Stream
Machine Methods in Meteorology
Microwave Propagation
Oceanographic Meteorology
Ozone
Radiation Bioclimatology
Snow Cover
Tropical Cyclones
Tropopause Variations

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the December issue cumulative author, subject, geographical and journal indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory (and American Meteorological Society) Library, Milton, Mass.
NN:	New York Public Library, New York, N. Y.
NNA:	American Geographical Society Library, New York, N. Y.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts

Geographic locations are in the English form rather than the form used locally, for example Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5–6):146–151, May–June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol 2), *Heft* 5–6 (No. 5 and 6), *pages* 146–151, May–June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

COMPENDIUM ARTICLES AND WORKS OF SPECIAL INTEREST

4.3–1 551.507.3:551.508.82

Bemis, Alan C. (*Mass. Inst. of Tech.*), **Aircraft meteorological instruments.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 1223–1231. 3 figs., 56 refs.) **MH-BH**—The author discusses the difficulties which are encountered aloft in measuring the basic meteorological quantities (air temperature, humidity in gm of water vapor/kg, true altitude, air pressure, wind velocity, liquid water content) which arise primarily as a result of the high velocity of the airplane, and reviews some of the methods devised to eliminate various sources of error. The measurement of temperature is subject to errors produced by heating of the thermometer, radiation effects and the presence of liquid water; instruments and techniques for eliminating these errors are special types of housing, vortex thermometer and radiant energy thermometers. The measurement of humidity by the dew point recorder, the use of the spectral hygrometer and the possible improvement of electrolytic and hair hygrometers are discussed. The measurements of pressure, altitude and wind velocity are least subject to error and the methods are well-established. Instruments and techniques for measuring liquid water content, techniques for measuring cloud and raindrop size (by catching samples in oil, through associated optical phenomena, direct photography, rain drop size meter) and snowflake and ice crystal size, and instruments for measuring vertical gust and draft, atmospheric electricity, etc. are reviewed. *Subject Headings:* **1. Air-borne instruments 2. Calibration of instruments 3. Airplane meteorograph errors 4. Compendium articles.**—*I.L.D.*

4.3–2 551.513(99)

†Court, Arnold (*U. S. Antarctic Service*, 1939–1941), **Antarctic atmospheric circulation.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 917–941. 3 figs., 4 tables, 140 refs.) **MH-BH**—This comprehensive review synthesizes present observational data and theoretical concepts of the Antarctic atmospheric circulation. The various anticyclone models of Antarctica's circulation, namely: the glacial, laminar, cellular, peripheral and abstract, are described and examined in "the light of present knowledge of topography and precipitation distribution, of pressure waves and oceanic storms, of upper air temperatures and pressure regimes," and it is shown that the circulation of Antarctica cannot be described satisfactorily by its annual pattern alone. The existing knowledge on the type and extent of the frontal zones surrounding Antarctica, the number and character of the air masses, the formation, trajectories and dissipation of subantarctic cyclones; and the properties of the nonperiodic waves of atmospheric pressure which are found on the barograms of all Antarctic stations and which have an amplitude of about 0.6 in. and their possible role in the Antarctic circulation are discussed. The seasonal variations of air temperature, the characteristics of precipitation, the height of the snow cover and of the ice cap and the variations of the extent of ice around the continental edge are reviewed. A detailed discussion of the hypothesis of a general absence of air exchange between Antarctica and the rest of the world based up an "exclusion principle" proposed by STARR is discussed and a general circulation scheme for the Antarctic is proposed. An extensive bibliography of 140 items on Antarctic meteorology, one hundred of which have been published within the past 20 years, is appended. *Subject Headings:* **1. Atmospheric circulation 2. Antarctic weather 3. Air masses 4. Compendium articles 5. Antarctic Bibliographies 6. Antarctica.**—*I.L.D.*

4.3–3 551.58

Durst, Charles Sumner (*Met. Off., London*), **Climate—the synthesis of weather.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 967–975. 3 fig., 3 tables, 33 refs.) **MH-BH**—The author stresses the need for a "reorientation of the

expression of climate and of the teaching of climate" and for an "explanation of climate as a physical and dynamical phenomenon." The inadequacy of purely statistical approaches to climate and the systematizations of climate by KENDREW and MILLER are discussed. The use of air masses to describe climate proposed by BERGERON in 1930, the applications of this method to the climate of Frankfurt a.M. by DINIES and to central Pennsylvania by LANDSBERG etc., the assessment of the thermal structure of different air masses by PALMÉN, PETTERSSEN and BELASCO are reviewed and the difficulties of air mass climatic description are pointed out. The application of synoptic maps for climatic description, providing an idea of climate as a synthesis of daily weather, began in England during World War II and its use by HARE to describe the climate of Southeast Asia, by LEE in the "Winter frontology of China" and by W. C. JACOBS and by ALISOV in the U.S.S.R. are summarized. In order to study climate as a physical and dynamical problem the author suggests the use of a method which considers the "climatological map of any element as the representative of an integration of the values of that element derived from trajectories which have their origin in certain source regions." *Subject Headings:* **1. Climate 2. Compendium articles.**—*I.L.D.*

4.3–4 551.515.1:551.524.7:551.54

*§Fujita, Tetsuya, **Studies on typhoon and convection.** *Tobata, Japan. Kyushu Institute of Technology. Meteorological Laboratory, Report,* 2(1/4), June **1952.** 206 p. 136 figs. tables, graphs, charts, 5 refs., eqs. **DWB**—A most comprehensive study on pressure and temperature distribution within typhoons and a new theory on convection problems with numerous examples of analyses is presented. A "cyclone function," $P=P_\infty-\psi P$ is proposed for the pressure distribution P from typhoon to continental cyclone in various stages. P_∞—undisturbed pressure, ΔP depth of the cyclone: $\psi=\left[1+\left(x\frac{x+1}{x+a}\right)^2\right]^{-\frac{1}{2}}$, $x=\frac{r}{r_0}$, r—radius, r_0—unit radius. Detailed tables for ψ $\frac{\partial\psi}{\partial x}$ and $\frac{\partial\psi}{\partial a}$ are given. The author claims and shows by examples that pressure tendency, filling and deepening, expansion and shrinking of isobars and the temperature distribution within typhoons can be studied by means of this formula. A detailed study of pressure oscillations associated with long period wind gusts is added and the phenomenon of "pressure dips" is discussed. The horizontal and vertical temperature distribution within typhoons is studied and considerable attention is given to errors in reporting upper air temperatures. A short note on föhn phenomena in typhoons is given. In order to explain horizontal convergence, the author proposes an equation of upward acceleration, introducing the "convection pressure," which is the deviation of actual air pressure from the weight pressure. The results are discussed for "normal vertical and overhang" fronts and for "overrunning cold air." A mechanism for typhoon and tropical storm initiation is proposed. *Subject Headings:* **1. Typhoons 2. Cyclone dynamics 3. Pressure oscillations 4. Upper air temperatures 5. Frontal theory 6. Japan.**—*A.A.*

4.3–5 551.596.1:551.508.4

Gutenberg, B., **Sound propagation in the atmosphere.** (In: **Compendium of meteorology** Boston, American Meteorological Society, **1951.** p. 366–375. 14 figs., table, 30 refs., 3 eqs.) **MH-BH**—The theory of sound waves in gases, the equations for velocity of sound in quiet and in moving air and the energy of sound waves in the atmosphere are first considered in detail. Then instruments for recording sound waves (microbarographs) and their limitations are discussed. Observations and records from microbarographs of sound propagation through the troposphere and the stratosphere, and abnormal audibility zones are treated in the last part of this paper. Numerous illustrations are presented to show types of records, areas of abnormal audibility from explosions (Germany, 1925 and Vergiate, Italy, Nov. 1920), travel time curves from explosions, cross sections showing typical paths of sound waves, and temperature and sound velocity profiles from V-2 flights and sound propagation data. Problems of wind effect and of natural pressure waves in atmosphere are among the most important for future study. *Subject Headings:* **1. Acoustical propagation 2. Microbarographs 3. Explosion waves 4. Compendium articles.**—*M.R.*

4.3–6 551.594.22:621.316.9

Hagenguth, J. H., **The lightning discharge.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 136–143. 2 figs., 2 tables, 2 refs.) **MH-BH**—The mechanism of the lightning stroke is described according to the latest theories, and illustrated. The evidence for the "pilot streamers" is not convincing, but the stepped-leader process, branching and the return stroke are confirmed by laboratory experiments. The initial process is likened to an avalanche. The most important mechanism is that of ionization. Ground streamers are sometimes noted. Current amplitudes can be estimated from light intensity (photographically). Observations at the Empire State Building in New York indicate that the stroke starts at the building, not the cloud, and there is no evidence of a return stroke from the cloud, as there is from the ground in cloud to ground discharges. Continuous currents are observed between successive discharges (in the ionized air created by the leader) in the atmosphere, but not in the laboratory. Maximum channel diameter is estimated at from 5 cm to 23 cm. Loudest thunder is associated with high intensity surge currents rather than low current steady discharges, as anybody can plainly see. Wind may affect path of lightning stroke. Potential gradients necessary for strokes are of the order of 100 V cm^{-1} (20–30 million volts for a 10,000 ft stroke), a figure greatly reduced by the effect of water drops. Cloud to cloud strokes are more frequent than cloud to ground, and return strokes are absent. Wave forms are similar however. Effects at ground (form and strength of current, wave shape of current peaks, effect of composite strokes, polarity and stroke density) are important for protection of installations. The reality of ball lightning is said to be still debatable. Methods of measuring lightning characteristics (magnetic links, fulchrochronographs, photographic surge, current recorders, cathode-ray oscillographs, the Boys cameras, measurements of electric field examination of damage, and laboratory reproduction) are discussed. Lastly, lightning protection methods are outlined. More information is required on all of the above processes (gradients, ionization, streamers, wave shape, stroke density through earth and effect of height, location and ground conditions around structures or installations). *Subject Headings:* **1. Electrical discharges 2. Lightning strokes 3. Ball lightning 4. Lightning protection 5. Compendium articles.**—*M.R.*

4.3–7 551.594.5(02) 550.385

†Harang, Leiv (*Norwegian Res. Establishment, Kjeller*), **The aurorae.** New York, John Wiley and Sons, **1951.** 166 p. 152 figs., 32 tables, eqs., bibliog. p. 159–163. *International Astrophysics Series*, v. 1. **DLC, DWB.** Review by W. Petrie in: *American Journal of Physics*, 20(3):187–188, March **1952. DLC**—This is the first comprehensive text on the aurora in the English language since the translation of FRITZ's work in 1883. The eight chapters take up in order: 1) forms, distribution, frequency, height, photography and calculation of pairs of plates; 2) height statistics in various regimes and for various types; 3) spectra: intensity and identification of lines, their interpretation with respect to temperature and composition of upper atmosphere; 4) sodium D-lines, twilight and night sky luminescence; 5) magnetic storms and auroras; 6) corpuscular theory; 7) physics of the upper atmosphere—density, absorption and emission, luminosity, relation to geographical height, etc. and 8) the ionosphere and the aurora and relation to terrestrial magnetic perturbations. The book is profusely illustrated with photographs, recorder records, schematic diagrams, graphs, charts and other illustrative material; has a good bibliography and brief author and subject indexes. It is based on the very latest observational material and theory. *Subject Headings:* **1. Auroras 2. Magnetic storms 3. Textbooks. I. Petrie, W.**—*M.R.*

4.3–8 551.511.4:551.509.312

Hinkelmann, Karl; Essenwanger, Oskar; Reymann, G. and Wippermann, Friedrich, **Physikalisch-mathematische Grundlagen der numerischen Integration in einer baroklinen Atmosphäre.** [Physical mathematical bases of numerical integration in a baroclinic atmosphere.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:416–428, **1952.** 4 figs., 19 refs., 25 eqs. **DWB**—In Pt. I, prognostic differential equations are formed for the variation with time of isobaric surfaces, the boundaries being the upper limit of the atmosphere and the earth's surface. In Pt. II, the determination of the coefficients and constants of these equations from synoptic charts and aerological data is considered. Pt. III describes the

solution of the equations by relaxation methods, with examples of the extension of a disturbance in a static standard atmosphere, showing the importance of stability. In the troposphere a disturbance extends vertically, in the more stable stratosphere, horizontally. *Subject Headings:* **1. Kinematic analysis 2. Dynamics of the atmosphere.**—*C.E.P.B.*

4.3–9 551.574.1

†Junge, Christian (*N.W. Germany*), **Die Konstitution des atmosphärischen Aerosols.** [The constitution of atmospheric aerosols.] *Annalen der Meteorologie, Beiheft,* **1952.** 55 p. 42 figs., 12 tables, 40 refs. German and English summaries p. 52–54. **DWB**—This important monograph first summarizes the size distribution of solid and liquid aerosols and discusses the formation of condensation nuclei. Coagulation is especially important and observations suggest that over continents aerosols are usually of mixed origin. Existing methods of counting are discussed from point of view of constitution of aerosols—Owen's dust counter, Zeiss conimeter and a new procedure for observing size changes of large nuclei with relative humidity. Above 70% they are mainly liquid and grow rapidly. Separation of solid and liquid particles is described. Marine nuclei are mainly salt crystals, continental ones have insoluble residues. Pt. 3 describes measurements of artificial and natural nuclei by a conimeter with 2 nozzles, and Pt. 4 measurements of growth by the spider thread method, which show that large nuclei are of mixed origin. Some electron microscope photographs are included. *Subject Headings:* **1. Aerosols 2. Condensation nuclei.**—*C.E.P.B.*

4.3–10 551.574.1

†Junge, Christian, **Nuclei of atmospheric condensation.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 182–191. 4 figs., 4 tables, 48 refs.) **MH-BH**—The three types of particles which can serve as condensation nuclei are first described (unwettable, wettable and soluble) and the physical conditions which affect each kind are outlined. A handy table shows relative sizes and magnitude of the ions, types and sources of nuclei or parameters involved in this field of study (range 2×10^{-7} to 2×10^{-3} cm) under varying conditions (ocean, country and city air). The size, number and methods of measurement; form and physical stability of nuclei, curves of growth relative to humidity or saturation; formation in smoke, mechanical sources, electrostatic charges, optical effects, processes of destruction (sedimentation, diffusion and coagulation), and rate of decrease depending on particle size and, lastly, suggestions for future study. The future progress is said to depend on development of new methods for measurement of the whole spectrum of nuclei. At present, methods give only the order of magnitude. Ion counting alone has not proven accurate. *Subject Headings:* **1. Condensation nuclei 2. Nuclei count 3. Cloud physics 4. Compendium articles.**—*M.R.*

4.3–11 551.594.7:621.396

§*New Zealand. Dept. of Scientific and Industrial Research, **Report of the factual data from the Canterbury Project. A radio-meteorological investigation in the South Island of New Zealand.** London, Pub. by the Dept., **1951.** 3 v. (857+283+187 p.) figs., tables, graphs, refs. v. 2–3 oversize. **DWB**—These three large volumes comprise the final report, including all of the data, charts and analyses of a joint scientific investigation conducted between Sept. 1946 and Dec. 1947 by the Dept. of Scientific and Industrial Research of the United Kingdom and of New Zealand. The "Canterbury Project" was planned in 1944 to provide information on the formation and behavior of low level atmospheric ducts caused by advection of warm dry continental air over the neighboring sea. An area in Canterbury Province of South Island, New Zealand was considered the most suitable. Vol. I, "Descriptive and numerical data," contains an analysis of all of the meteorological and radio data collected during this period and all of the detailed surface, upper air, synoptic and oceanographic data for the entire area around New Zealand. Airplanes, radar, balloons, radiosondes and ship observations were used intensively and extensively. Each separate situation is described and analyzed. Surface (coded) synoptic observations are given for 00, 03, 06, 09, 12, 15 and 18h for a score of stations. The observational, operational and theoretical considerations are also treated at great length and in detail. Vol. II, "Meteorological data," consists of a large "atlas" type presentation of graphs and charts prepared from the meteorological data collected

during this survey. A detailed topographical map of the region and a cross section showing the relief in relation to observation stations is followed by detailed isopleth and sounding diagrams of potential temperature, specific humidity, temperature and upper air winds for levels from the sea level to 2000 ft height. Actual anemograph traces for the 50 ft level are reproduced for several stations for each of the 50 or so situations studied. Synoptic charts are presented for 1200h local time for the Australasian region for all of the periods when data were obtained. Isopleth cross sections of potential temperature and specific humidity are given in great detail for a range of 25 mi of land and 120 mi at sea (to 1000 ft). Soundings are given for both land and sea. Vol. III, "Radio-wave propagation data," also consists of large detailed graphs and isopleth cross sections of modified refractive index, height gain curves, etc. from aircraft and ship soundings from 0 to 1000 or 2000 ft height. About 50 separate situations are thoroughly analyzed in this fashion. *Subject Headings:* **1. Radiometeorological investigations 2. Radio wave propagation 3. Tropospheric propagation 4. Radio transmission ducts 5. Canterbury Project 6. South Island, New Zealand. I. Great Britain, Dept. of Scientific and Industrial Research.**—*M.R.*

4.3–12 551.5:(05)(68)

*South Africa. Weather Bureau, **Notos.** First issue 1(1), **1952.** Pretoria, Pub. by the Bureau. Editors: M. P. van Rooy, R. J. Venter and A. J. Drummond. Photoprinted. Price: 35s per v., 10s per number. Probably 4 numbers per v. In English, French, German and Afrikaans; summaries in English. **DWB**—A new periodical devoted exclusively to the general circulation in the Southern Hemisphere. It will be a medium for the dissemination of basic data (daily pressures at fixed grid points for the whole hemisphere, etc.), and will include also original papers, correspondences and bibliographic reviews. *Subject Headings:* **1. Periodicals 2. Atmospheric circulation 3. Southern Hemisphere. I. van Rooy, M. P.** (*ed.*) **II. Venter, R. J.** (*ed.*) **III. Drummond, A. J.** (*ed.*).—*A.A.*

GENERAL METEOROLOGY

See also: **S. African Weather Bureau notes,** 4.3–12

4.3–13 551.5:06

World Meteorological Organization, **First Congress, Paris, 19 March–28 April 1951. Final report, v. 1, Resolutions.** *World Meteorological Organization, WMO*, No. 1/I, [1951]. 117 p. Price: Sw. fr. 2. **DWB**—This volume includes the basic resolutions governing the transfer of the International Meteorological Organization to the World Meteorological Organization, the projects taken over or initiated by the new Organization, financial and personnel arrangements, etc. These are elaborated in a series of appendices. *Subject Headings:* **1. World Meteorological Organization 2. WMO. Resolutions.**—*C.E.P.B.*

4.3–14 551.5:06

World Meteorological Organization, **First session of the Executive Committee, Paris, April 30–May 1, 1951, Resolutions.** *World Meteorological Organization, WMO*, No. 3, [1951]. 14 p. Price: Sw. fr. 0.50. **DWB**—Resolutions dealing with budget and finance, contributions from member countries. Organization of WMO, relocation of Secretariat, etc. are given in English. *Subject Headings:* **1. WMO. Publications 2. WMO. Secretariat 3. WMO. Resolutions.**—*M.R.*

4.3–15 551.5:06

World Meteorological Organization, **Second session of the Executive Committee, Lausanne, Oct. 3–20, 1951, Resolutions.** *World Meteorological Organization, WMO*, No. 4, [1951] 151 p. Price: Sw. fr. 2.50. **DWB**—Numerous resolutions concerning the operation of WMO, the Secretariat and various working committees are given in full and specifications for technical assistance to several countries appended. Detailed staff rules are also included. *Subject Headings:* **1. WMO. Publications 2. WMO. Secretariat 3. WMO. Resolutions.**—*M.R.*

4.3–16 551.5:5:06(73/9)

Waterman, Alan T. (*Dir. of the Natl. Sci. Foundation*). **Remarks before the American Meteorological Society, New York City, Jan. 30, 1952.** *American Meteorological Society, Bulletin*, 33(5):183–187, May 1952. **MH-BH**—A brief description of the history of the National Science Foundation and of its program and its operations -namely, the approving of grants for projects and awarding of fellowships. A list of principal scientific personnel is given. A sketch of the extent of meteorological research conducted during World War I is presented. *Subject Headings:* **1. National Science Foundation 2. History of Meteorology 3. United States.**—*I.L.D.*

4.3–17 551.5:55:52:91(03)

Glossary of meteorological, geographical, geological and astronomical terms in Japanese, English, German and French. Extract from: **Picture Dictionary, Bildwörterbuch, Dictionnaire illustré.** Tokyo and Osaka, Sanseido, [n.d.] p. 6–25. Photostat. **DWB**—Technical terms are listed in four languages and illustrated. The Japanese terms are written in Chinese (Kanji) characters without transliteration; phonetic (Katakana) writing is used for those Japanese words which had been adopted from European languages. The section on meteorology includes over 100 terms connected with meteorological instruments, clouds, weather charts, the atmosphere and signal stations. Other sections contain words applicable to maps, mountains, glaciers, the sea, islands, earthquakes, optical phenomena, the seasons, calendars, etc. The vocabulary covered consists almost entirely of nouns. *Subject Headings:* **1. Glossaries 2. Geographical terminology 3. Geological terminology 4. Astronomical terminology 5. Japanese language.**—*G.T.*

4.3–18 551.5:52(03):494.511

Lassovszky, Károly and Réthly, Antal (*eds.*). **Csillágaszati és meteorológiai lexikon.** [Astronomical and meteorological encyclopaedia.] Budapest, Franklin-Társulat, [n.d.] 236 p. 33 plates, diagrs., charts. **MH-BH**—In Pt. 2 ("Meteorological encyclopaedia," p. 103–236) some 1400 meteorological terms are listed (some of them illustrated by good photographs or drawings) and their definition and explanation added in notes extending, in some cases, up to one page per word. The vocabulary is strictly confined to the fields of meteorology and climatology and includes brief biographies of workers in those fields. Even though the last 10 years' development is not included, this book could still be useful as a guide to Hungarian meteorological terminology. The meteorological glossary was edited by A. Réthly and contributions were made by N. Bacsó, Z. Berkes, B. Béll and G. Tóth. *Subject Headings:* **1. Encyclopaedias 2. Terminology 3. Meteorologists 4. Hungarian language. I. Bacsó, Nándor II. Berkes, Zoltán III. Béll, Béla IV. Tóth, Géza.**—*G.T.*

4.3–19 551.5:63:016

†Germany. Deutscher Wetterdienst in der US-Zone, **Agrarmeteorologische Bibliographie, 1949, 2. Teil.** [Agrometeorological bibliography, 1949, Pt. 2.] Bad Kissingen, **1952.** 255 p. **DWB**—Over one thousand references (with abstracts) are arranged according to 9 major heads and over 80 subheads. The main divisions comprise: 1) general bibliography, history, texts, organizations; 2) local climate, microclimate; 3) climate, weather and soil, 4) and plants; 5) and agriculture, 6) and plant diseases, 7) and animals, 8) instruments and methods, and 9) important articles from allied disciplines. The total of 1071 items received by the US-Zone Weather Service in 6 months (July 1–December 31, 1949) would be surprising if it represented only 6 months output, but actually it includes a huge backlog of material published during and after the war as well as the 1949 publications. A list of several hundred journals and serials, and annotations regarding 50 of the most important periodical sources, author and subject indexes are also included. (For Pt. I *see item* 3.2–167, Feb. 1952, *MAB.*) *Subject Headings:* **1. Agricultural meteorology 2. Agricultural meteorology bibliographies. I. Schneider, Max** (*comp.*).—*M.R.*

4.3–20 551.5:63:92(47)

Maksimov, S. A., **P. I. Brounov—osnovopolozhnik sel'skokhoziaĭstvennoĭ meteorologii.** [P. I. Brounov—the founder of agricultural meteorology.] Leningrad, Gidromet. Izdat., **1950.** 43 p. 5 figs. **DLC**—P. I. Brounov, born in 1852 in St. Petersburg, Russia, worked about

fifty years in physical geography, oceanography, general meteorology and especially in agrometeorology. He has written about 120 papers and established in 1897 the first agrometeorological service in the world. A map of the agrometeorological stations and a map with the distribution of droughts in Russia are given. *Subject Headings:* **1. Biography 2. Brounov, P. I. 3. Agro-meteorological services 4. Drought 5. U.S.S.R.**—*A.A.*

4.3–21 551.5:63:551.509.6(438)

Molga, Marian, **Stan obecny i potrzeby agrometeorologii w Polsce ludowej.** [The present state and needs of agrometeorology in the Polish Peoples Republic.] *Przegląd Meteorologiczny i Hydrologiczny*, v. 1950–1951:315–328, **1951. DWB**—Contains a review of work done in Poland before the war, a detailed report of post-war attainments and suggestions for the future development. The author divides the problems into four groups: 1) the influence of meteorological conditions on agricultural production, the planning of cultivation; 2) microclimatological works, solving individual scientific-agricultural problems; 3) changing of climatic conditions by man and 4) microclimatological investigations concerning the organs of animals bred on farms. *Subject Headings:* **1. Agricultural meteorology 2. Microclimatology 3. Artificial climates 4. Animal ecology 5. Poland.**—*Wanda Tomczykowski.*

4.3–22 551.5:63(438)

Molga, Marian, **Tezy z meteorologii rolniczej i leśnej.** [Questions concerning agricultural and forest meteorology.] *Przegląd Meteorologiczny i Hydrologiczny*, v. 1950–1951:339–345, **1951. DWB**—An outline for the organization of agricultural and forest meteorology in Poland. This organization will include the following sections: 1) agrometeorology, 2) forest meteorology, 3) soil climate, 4) elaboration of measurement methods and 5) phenology. The plans and projects foreseen for each of the sections are given. *Subject Headings:* **1. Agricultural meteorology 2. Forest meteorology 3. Soil climatology 4. Phenology 5. Poland.**—*Wanda Tomczykowski.*

4.3–23 551.5:63(431/5)

Schnelle, F. (*Bad Kissingen*), **Aktuelle Probleme der Agrarmeteorologie.** [Present problems in agricultural meteorology.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 32:85–90, **1952. DWB**—The problem of how to increase yield is discussed. The most important problems of basic research are the water economy of the soil and of plants and the relationship between weather and yield. *Subject Headings:* **1. Agricultural meteorology 2. Germany.**—*A.A.*

4.3–24 551.5:63:551.588.7(431/5)

Schwenkel, Hans, **Agrarmeteorologie und Landschaftspflege.** [Agricultural meteorology and conservation of the landscape.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 32:110–111, **1952. DWB**—A general discussion of the relationship between agricultural meteorology and land use. The mode of utilization changes the water economy and microclimatic conditions so that the productivity of the soil decreases. *Subject Headings:* **1. Agricultural meteorology 2. Land utilization 3. Water conservation 4. Germany.**—*A.A.*

4.3–25 551.5:656.1

Tanner, J. C., **Weather and road traffic flow.** *Weather*, 7(9):270–275, Sept. **1952.** fig., photo, 3 tables, ref. **DWB**—Results of automatic and manual counts of vehicles passing 5 points in England were correlated with maximum temperature, duration of sunshine and amount of rain, and regression equations calculated. Effect of rain, snow and snow or ice on roads on different kinds of traffic is examined. Traffic increases linearly with visibility code number (0–9). *Subject Headings:* **1. Road traffic 2. Weather conditions.**—*C.E.P.B.*

4.3–26 551.5:06(71)

McLeod, K. T. (*Public Weather Services, Canada*), **The Public Weather Service of Canada.** *Royal Meteorological Society, Canadian Branch*, [*Publications*], 3(4):15–22, May 1, **1952. DWB**—After a brief historical survey of Canadian meteorology from its origin a hundred years ago up to its present network of 1,294 observing stations (including 244 regular synoptic

reporting stations), 41 forecast offices and over 22,000 mi of teletype lines, the author describes some of the problems of modern meteorological services. The necessity of familiarizing forecasters with the special needs of aviation, farming, industry, etc., and the importance of a meteorological education for the public weather-information consumers and of better coordination between meteorological services and the public are stressed. Progress in the past and prospects for the future, for instance in the field of weather control, are outlined. *Subject Headings:* **1. Progress in meteorology 2. Industrial meteorology 3. Canadian weather service 4. Canada.**—*G.T.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Apparatus for conversion of infrared spectrometer records to percentage transmission** (Carrington and Reynolds), 4.3–47; **Mori-type sunshade for thermometers** (Komiya), 4.3–51; **Double theodolite observations of "Bishop Wave"** (Colson), 4.3–166; **Acoustical sounding of clouds** (Zanotelli), 4.3–210; **Snow conditions, Russia, Poland, Germany,** 4.3–224; **Climatic survey for town planning** (Böer), 4.3–258; **Statistical approach to measurement of atmos. noise** (Hoff and Johnson).

4.3–27 551.501.1:551.577:551.508.77

*Bac, Stanislaw, **Wpływ sposobu pomiaru na oznaczanie wysokosci opadu.** [Influence of the method of measurement on the indication of precipitation amounts.] *Przegląd Meteorologiczny i Hydrologiczny*, v. 1950–1951:16–32, **1951.** 4 figs., 5 tables. English summary p. 32. **DWB**—Results of a comparison of 6-year precipitation measurements with ordinary rain gages placed at ground level, with readings of a Hellmann rain gage (200 sq cm) installed 1 m above ground level, are described and discussed. They show that Hellmann gage readings are always undervalued; this discrepancy rises with an increase in precipitation or an increase in the size of gages installed at ground level. *Subject Headings:* **1. Precipitation measurement 2. Rain gage comparisons 3. Hellmann rain gage.**—*A.M.P.*

4.3–28 551.501.1(02)

Great Britain. Meteorological Office, **Marine observer's guide. Information for the use of the Voluntary Observing Fleet of the British Commonwealth of Nations cooperating with Meteorological Services.** 2nd ed. **1951.** fold, charts, forms, refs. 7 separately paged parts. MO. 477. **DWB**—Contains general information for weather observations on selected and supplementary ships, observations notes, code tables, a list of shore W/T radio stations and local meteorological services of shipping, a glossary of terms used in shipping forecasts (English, French, Spanish and Russian) and a list of past meteorological officers. *Subject Headings:* **1. Observers manuals 2. Marine meteorological observations.**—*A.A.*

4.3–29 551.501.4:551.586:628.8

Ramsey, Melvin A. (*Worthington*), **Simplifying the choice of cooling and dehumidifying equipment.** *Heating, Piping and Air Conditioning*, 24(1,2,3):149–151; 98–100; 95–97, 99, Jan., Feb., March **1952.** 8 figs. **DLC, DWB**—The author presents a psychrometric chart particularly suited for air conditioning calculations, with dry bulb degrees and grains of moisture per pound of dry air plotted with equal divisions for each degree and each grain per pound. Principles of the chart's use in heat transfer calculations are explained and represented by curves. Examples are worked out to explain the practical application of the chart and arithmetical rules are derived to facilitate calculations. Problems connected with the choice of foils are considered. *Subject Headings:* **1. Psychrometric charts 2. Heat transfer 3. Air conditioning.**—*G.T.*

4.3–30 551.501.45:551.579:518.2

Andreianov, V. G., **Postroenie krivykh obespechennosti sutochnykh raskhodov i krivykh ispol'zovaniia stoka pri otsutstvii nabliudenii.** [Construction of summation curves of the daily discharges and of runoff utilization curves without observation results.] *Leningrad.*

Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy, No. 14(68):218–263, **1949.** 9 figs., 7 tables, 11 refs., 46 eqs., append. **DLC**—An excellent contribution to this application of mathematical statistics. A detailed comparison of different analytical formulas for the summation curve of the frequency distribution of daily discharges is given. It is found that the best results are given by a formula of V. A. Uryvaev, based on the general expressions found by R. D. Goodrich. (*American Society of Civil Engineers, Proceeding*, 52(6), 1926). The "utilization curve" is the integral of the summation curve, demonstrating in such way the possibility of runoff utilization. Nomograms for practical calculations are given. *Subject Headings:* **1. Runoff utilization 2. Distribution curves 3. Mathematical techniques. I. Goodrich, R. D. II. Uryvaev, V. A.**—*A.A.*

4.3–31 551.501.45:551.482

Coutagne, Aimé, **Initiation mathématique à l'hydrologie fluviale.** [Mathematical introduction to river hydrology.] *La Houille Blanche*, Grenoble, 7(2):245–268, April **1952.** 8 figs. English summary p. 245. **DLC**—Without going into technical detail on the application of mathematical methods in hydrology, the author quotes several authorities emphasizing the scientific importance of statistics in general. The laws of average, deviations, probabilities and frequencies of occurrence and formulae and curves representing them are explained and discussed. A theoretical analysis of the correlation between two or more variables and of forecasts based on them is offered. The author concludes by pointing out that there is a "law of chance" which will forever obstruct all efforts to draw a dividing line between the "probable" and the "impossible." *Subject Headings:* **1. Hydrology 2. Statistical techniques 3. River forecasting.**—*G.T.*

4.3–32 551.501.45

Möller, István, **Meteorológiai osztályozások.** [Statistical classifications in meteorology.] *Időjárás*, 54(5/6):146–153, May/June **1950.** 3 figs., 2 tables. **MH-BH**—Mathematical functions representing various methods of statistical classification applicable to meteorological elements are developed through a series of equations. Distinction is made between qualitative and quantitative classification, classification with one or more categories and with one or more criteria. Author explains how to arrange data into series of categories through the use of one of three functions: 1) $f(x)=ax+b$, 2) $f(x)=ax^2+bx+c$ or 3) $f(x)=ab^x+c$, provided that x indicates one in a series of categories from 0 to n, $f(x)$ means the numerical value of that category and a, b and c are constant values. Examples for the application of the functions are given and curves corresponding to the functions types (1) and (2) are presented. *Subject Heading:* **1. Statistics in meteorology.**—*G.T.*

4.3–33 551.501.7:551.547

Casswell, S. A., **Method of calculating from the tephigram the thickness of the layer of air between any two standard pressure levels.** *Meteorological Magazine*, London, 81(964): 295–298, Oct. **1952.** fig., eqs. **DWB**—Method is: fit a straight line to tephigram, read temperature at pressure p (e.g., for 1000–500 mb $p=714$ mb, etc.), add a correction for dew point to get mean virtual temperature, and read off thickness on a scale given. *Subject Headings:* **1. Upper air computation 2. Relative topography.**—*C.E.P.B.*

4.3–34 551.501.7:518.3

Gifford, Frank, Jr. (*U. S. Weather Bur., Wash., D. C.*), **An alignment chart for upper wind vector computation involving large horizontal distances.** *Monthly Weather Review*, 79(12):215–217, Dec. **1951.** 2 figs., 2 eqs. **MH-BH**—The absolute value and direction of a wind vector is expressed in terms of two known successive horizontal distances between the point of observation and the positions of the balloon or target and the angle formed by the corresponding two azimuths. With the equations obtained an alignment chart is constructed from which wind direction and trajectory can be determined in three simple operations instead of at least seven as would be necessary if an ordinary slide rule were used. *Subject Headings:* **1. Wind vector computations 2. Upper air wind computation 3. Nomograms.**—*G.T.*

4.3–35 551.501.7:551.507.352(02)

U. S. Air Weather Service, **Weather reconnaissance observations.** *U. S. Air Weather Service, Manual*, 105–31, July 31, **1951.** 47 p. tables, graphs, refs. **DWB**—This manual was issued with the purpose of standardizing weather observing techniques for Air Weather Service weather reconnaissance units. Instructions are given regarding instrument correction, computation, calibration, air craft sounding, recording data, observing techniques and monitoring reconnaissance weather reports. Computation tables, nomograms and diagrams to be used in making corrections and in evaluating dew point temperature, relative humidity, virtual temperature, altitude, etc., are presented. *Subject Headings:* **1. Airplane weather reconnaissance 2. Observers manuals 3. Computation tables 4. United States.**—*G.T.*

OBSERVATIONAL DATA

4.3–36 551.506(09)(42)

Manley, Gordon, **The weather and diseases: some eighteenth century contributions to observational meteorology.** *Royal Society of London, Notes and Records*, 9:300–307, May **1952.** photo, table. Abstracted from reprint.—An account of early instrumental weather observations in England, from ROBERT HOOKE ("Temperature and rainfall," London, 1664) to 1808, and early thermometers. A special account, with photograph, of JAMES JURIN, Secretary of the Royal Society, who in 1723 inspired several series of regular temperature observations "in a cool room." *Subject Headings:* **1. History of meteorology 2. Jurin, J. 3. England.**—*C.E.P.B.*

4.3–37 551.506.1(931)

*Apia. Observatory, **Magnetic and meteorological results for 1949.** Wellington, N. Z., Govt. Printer, **1951.** 146 p. mostly tables. **DWB**—Title before 1948 "Annual Report for. . . ." The essential material is the same each year. The first part gives the results of magnetic observations carried out at the observatory under the direction of the Christchurch Geophysical Observatory. Seismological and tidal observations were also made along with sea temperatures and density measurements. The meteorological data collected under the supervision of the New Zealand Meteorological Department, consist of the usual daily synoptic observational data plus sunshine, wind frequency, upper winds (daily), vapor pressure. Rainfall data for Apia Observatory and for other stations in Samoa, and climatic data for Fakaoto, Nukunono and Atafu are presented. *Subject Headings:* **1. Climatic data 2. Observational data 3. Annual summaries 4. Magnetic observations 5. Upper air wind data 6. Apia, Samoa.**—*M.R.*

4.3–38 551.506.1:551.591(058)(46)

*Barcelona. Observatorio Fabra. Sección Meteorológica y Sísmica. **Boletín.** No. 39, **1952.** [Bulletin, No. 39, data for 1950.] 87 p. mostly tables. **DWB**—Each year's issue contains 4 hourly temperature data for each day, decade, month and for the year, soil surface temperature, precipitation, pressure, evaporation, wind direction and speed, maximum direction, frequencies of wind, relative humidity, frequency of hydrometeors, visibility of various objects (scale of 0–4), amount and type of clouds. Seismic observations and an analysis of severe earthquakes in Catalonia are appended (*See items* 2.5-25 and 2.7–24 in May and July 1951, *MAB*). *Subject Headings:* **1. Observational data 2. Annual summaries 3. Visibility data 4. Fabra Observatory, Spain. I. Alvarez Castrillón y Bustelo, Manuel II. Campo Cunchillos, G.**—*M.R.*

4.3–39 551.506.1(495)

*Greece. Ethnikē Meteōrologikē Hypēresia, **Mēniaion Klimatologikon Deltion.** [Monthly climatological bulletin.] First No. received, v. 1, No. 1, Jan. **1950.** mostly tables. In Greek and French. **DLC**—This publication gives a general summary of weather development during the month, followed by tables of daily and monthly means, extremes and deviations of temperature, precipitation, relative humidity, wind, visibility and number of days on which one or several of 15 different hydrometeors were observed. These data cover 31 stations whose altitude and geographic location is specified and shown on a map. *Subject Headings:* **1. Monthly climatic reports 2. Observational data 3. Greece.**—*G.T.*

4.3–40 551.506.1(495)

*Greece. Ethnikon Asteroskopeion Athēnōn. Meteorological Institute, **Monthly climatological Bulletin.** v. 1(1–2), Jan.–Feb. **1952.** entirely data. Latest issue received; No. 12, Dec. **1952.** Annual summary included. **DWB**—This new series presents daily and monthly data on air pressure, temperature, precipitation, humidity, vapor pressure, wind, evaporation, sunshine, cloudiness, visibility toward sea and land, soil temperature (surface 2, 5, 10, 15, 20, 30, and 50 cm) and ground condition. Each monthly issue consists of 2 pages, mimeographed on one side. *Subject Headings:* **1. Monthly bulletins 2. Observational data 3. Athens, Greece.**—*M.R.*

4.3–41 551.506.1:551.515(54)

†India. Meteorological Dept., **India Weather Review: Annual Summary, 1945, Part C, Storms and Depressions.** 11 p. 8 tables, 2 charts. Appended: **Publications of the India Meteorological Department up to July 1950.** Delhi, **1951. DWB**—Case histories of four storms and eleven depressions which formed during the year in the Bay of Bengal and of one land depression over Chota Nagpur and a log of 50 western disturbances (two of which are described in detail) and of 35 local storms are presented. The tracks of the cyclones and depressions are plotted on a map of the India region and their daily positions indicated. *Subject Headings:* **1. Annual summaries 2. Storms 3. Depressions 4. India. I. Sohoni, V. V.**—*G.T.*

4.3–42 551.506.1(569.4)

*Israel. Meteorological Service, **Monthly Weather Report.** Earliest report received, Jan. 1949. Latest report received, May 1951. *Israel. Meteorological Service, Series B*, No. 4/W–15/W, 17/W–31/W, 33/W–34/W, **1949–1951.** entirely tables. In English and Hebrew. **DWB**—This monthly summary gives for all weather stations in Israel the mean monthly wind frequency and wind force, dry bulb temperature, relative humidity, cloudiness for 0600, 1200 and 1800 hours, mean monthly rainfall, evaporation (Piché), visibility, extreme maximum and extreme minimum temperatures. Daily rainfall for the coastal plain, the hill region and the Jordan Valley and graphs giving the departures of rainfall, relative humidity and temperatures from the normal are presented. *Subject Headings:* **1. Monthly weather reports 2. Observational data 3. Israel.**—*I.L.D.*

4.3–43 551.506.1:551.579(45)

*Italy. Ufficio Idrografico del Magistrato alle Acque, Venezia, **Bollettino mensile.** [Monthly bulletin.] May **1950.** 36 p. chiefly tables, chart. **DWB**—Daily mean maximum and minimum dry bulb temperatures, mean relative humidity, wind velocity, cloudiness and rainfall are given for all weather stations in Venezia for May 1950. For the same period are given daily water level heights along the more important rivers, discharge of rivers, ground water levels and tide data. *Subject Headings:* **1. Monthly weather reports 2. Observational data 3. Hydrologic services 4. Venezia, Italy. I. Vollo, Luigi.**—*I.L.D.*

4.3–44 551.506.1:551.521.1(058)

*Japan. Central Meteorological Observatory, Tokyo, **Actinometric Bulletin.** First issue received No. 21, 1943, published 1952; last issue received No. 28, 1950, published **1951.** Title page in English and Japanese, text in English. **DWB**—Whole sky radiation measurements made with Robitzsch type actinographs (first made in Japan in 1931 and at a network of stations since 1935) are tabulated in detail. In 1940 there were 30 stations and by 1945—60 stations all over the occupied region. Since 1945 the number has decreased to about 30. Solar and sky radiation on horizontal surfaces are given by hours (5 day means) and total for day. *Subject Headings:* **1. Actinometric data 2. Global radiation networks 3. Annual reports 4. Japan.**—*M.R.*

4.3–45 551.506.7(42)

*Great Britain. Meteorological Office, **Upper air data for stations maintained by the Meteorological Office, 1946–50, Part I, Larkhill.** H.M. Stationary Office, **1952.** 52 p. mostly tables, 4 graphs. M.O. 555. **GB-MO**—Summaries and frequencies of height, tem-

perature, humidity, and winds, for standard pressure surfaces and of temperature and pressure of tropopause for British stations making radiosonde and radar wind measurements. (This volume contains only Larkhill data.) Most of the data appear in graphic form as well as in contingency tables. *Subject Headings:* **1. Upper air data 2. Tropopause 3. Larkhill, England.** —*M.R.*

4.3–46 551.506.7:551.508.822(52)

*Japan. Central Meteorological Observatory, Tokyo, **Aerological data of Japan (radiosonde) October, November and December 1948.** Tokyo, March, July and Sept. **1950.** 60, 80, 60 p. All tables. *Idem,* **Aerological data of Japan during the international aerological days December 8th–17th, 1949.** Tokyo, March **1950.** 45+p. numerous figs. and tables. In English. *Idem,* **Aerological data of Japan, February 1950.** Tokyo, March **1950.** 212 p. *Idem,* **Aerological data of Japan. Winds aloft March 1948 and June 1948.** Tokyo, March and Aug. **1950.** 99, 88 p. **DWB**—1) Daily free air pressure, temperature, humidity and heights of pressure surfaces are presented for 13 stations in Japan for standard levels up to 20 km. 2) Upper air data given for the period Dec. 8–17th, 1949. 3) In this series both radiosonde (pressure, temperature, humidity, height and tropopause data) and winds aloft are presented for 12 stations. In wind summaries, the mean velocity, the most frequent direction and the maximum velocity of the month are given for each station for 00, 06, 12 and 18h. Radiosonde data are also summarized. 4) Wind aloft data for 23 stations (1–4 times daily) presented in detailed tables for each day of the month. *Subject Headings:* **1. Radiosonde data 2. Upper air data 3. Upper air wind data 4. Tropopause 5. Japan.**—*M.R.*

INSTRUMENTS AND INSTRUMENT CARRIERS

See also: **Aircraft meteorological instruments** (Bemis), 4.3–1; **Sound propagation in atmos.** (Gutenberg); **Precipitation measurement** (Bac), 4.3–27; **Radiosonde data, Japan,** 4.3–46; **Effect of aircraft charge on conductivity measurements** (Coronity, Parziale, Callahan and Patten), 4.3–61; **Evaluation of particulate concentration with collecting apparatus** (Hall), 4.3 91; **Sky radiation, Lunz** (Dirmhirn), 4.3–136; **Correlation of bioclimatic UV and total solar radiation, Wash., D. C., 1941–1950** (Coblentz), 4.3–137; **UV radiation, Afghanistan** (Stenz), 4.3–147.

4.3–47 551.508.25:551.501.4

Carrington, R. A. G. and Reynolds, J. G. (*Thornton Res. Centre, Chester, England*), **Apparatus for conversion of infra-red spectrometer records to percentage transmission.** *Journal of Scientific Instruments,* 26(9):197–199, June **1952.** 4 figs., 6 refs. **DLC**—When measuring infrared (2–15μ) transmission and converting to percentage transmission, it requires a great deal of time to replot the records from the two traces when a single beam spectrometer is used. Various time-saving methods are mentioned and the authors' method, which is quick and easy to operate and calculate, described in detail. A wedge-scale which can be super-imposed on the recorder record, is devised and an illustrative example of its use presented. *Subject Headings:* **1. Infrared transmission calculations 2. Infrared spectrometers.**—*M.R.*

4.3–48 551.508.25:551.521.61

Lord, R. C.; McDonald, R. S. (*Mass. Inst. of Technology, Spectroscopy Lab.*) and Miller, Foil A. (*Mellon Inst. of Industrial Research*), **Notes on the practice of infrared spectroscopy.** *Optical Society of America, Journal,* 42(3):149–159, March **1952.** 6 figs., 35 refs. **DLC**—Miscellaneous techniques for infrared prism spectroscopy are described in detail. These include: techniques for cleaving, cutting, and polishing alkali halide crystals for absorption cell windows; construction of absorption cells for liquids and gases, including some suitable for high and low temperatures and one of long path; the measurement of cell thickness; removal of atmospheric absorption; techniques useful for wave lengths above twenty-five microns; formulas for recording inks. A modified source-optical system and a method of calibration adjustment for Perkin-Elmer Model 12 instruments are also discussed. *Subject Heading:* **1. Infrared spectroscopy.**—*Authors' abstract.*

4.3–49 551.508.25:551.521.4

Pastiels, R. and Peiciu, S. (*Belgium, Inst. R. Met.*), **Sur l'emploi d'un récepteur photo-électrique en spectrographie du ciel nocturne.** [On the use of a photoelectric receiver in night sky spectrography.] *Ciel et Terre*, 68(3–4):67–68, March–April **1952.** 3 refs. **MH-BH**—A photoelectric receiver was substituted for the photographic plate in a "C.I.-type" Huet spectrograph and this experimental apparatus was used for measurement of the night sky on Jan. 24 and 26, 1952. The instrument is described in detail and claimed to be very useful for checking photometers with filters and examining the selectivity of filters used in measuring the light of the night sky. The instrument is also said to record most of the variable phenomena in the emission of the sky during twilight and night. *Subject Headings:* **1. Night sky spectrum 2. Spectrographs 3. Photoelectric receivers.**—*G.T.*

4.3–50 551.508.26

Richter, K. H., **Über die Anzeige-Trägheit von Temperatur-Messinstrumenten in der Klimahütte.** [On the lag of the indicators of thermometers in the screen.] *Germany. Deutscher Wetterdienst in der U.S.-Zone, Berichte*, No. 38:343–347, **1952.** 4 figs., tables, 8 refs., 9 eqs. **DWB**—The lag of a thermometer is measured by t_H, the time it takes to change by half the amount of a sudden change of temperature. Values of t_H are given for various types of thermometer with different rates of ventilation. The damping of periodic changes of temperature (1 min to 1 hr) is also discussed. *Subject Heading:* **1. Thermometer lag.**—*C.E.P.B.*

4.3–51 551.508.27:551.501.1

Komiya, Shonosuke, **The Mori-type sunshade for thermometers.** *Iwate Meteorological Association, The Review*, p. 30–32, Nov. **1951.** table, diagrs. In Japanese, English summary in append. p. 4. **DWB**—A recently developed sunshade for outdoor temperature measurement is described and shown in a schematic diagram. Data on comparative measurements made with this new type apparatus and with the sunshade manufactured by the Ota Keiki Co., which has been used previously, are presented in a table. *Subject Headings:* **1. Thermometer screens 2. Instrument comparisons 3. Japan.**—*G.T.*

4.3–52 551.508.29

Kaufman, Alvin B. (*Northrup Aircraft, Inc.*), **Bismuth thermocouples.** *Instruments*, Pittsburgh, 25(6):762, 802–803, June **1952.** 3 figs., 2 tables. **DWB**—It is pointed out that great resistance change with temperature, low thermal capacity, small thermal conductivity and high thermocouple voltage per degree change in temperature are properties which are found in bismuth to a higher degree than in any other metal and make it the best suited for use as thermocouples within its operating range, i.e., at low temperatures. Practical details of the use of bismuth thermocouples are discussed. Responses of various thermocouples are graphically represented. *Subject Headings;* **1. Bismuth thermocouples 2. Thermocouples.**—*G.T.*

4.3–53 551.508.29:537.32

Koitzsch, R., **Über den Einfluss der Temperatur der Gegenlötstelle bei thermoelektrischen Messungen mit Elementen aus Kupfer-Konstantan.** [The influence of the temperature of the reference junctions on thermo-electric measurements with copper-constantan elements.] *Zeitschrift für Meteorologie*, 6(5):129–132, May **1952.** 3 figs., ref., 12 eqs. **DWB**—A mathematical analysis of the relationship between changes of temperature at the reference junction and the measuring junction and a description of the determination of the constants α and β in the equation showing the relation between e.m.f. and temperature difference between reference and measuring junction. *Subject Headings:* **1. Thermo-electric measurement 2. Temperature instruments 3. Temperature effects.**—*I.L.D.*

4.3–54 551.508.29:536.53

Mäde, Alfred, **Zur Methodik mikroklimatischer Temperaturmessungen.** [On the technique of microclimatic temperature measurements.] *Angewandte Meteorologie*, 1(7):215–219, Oct. **1952.** fig., 7 refs. **MH-BH**—Owing to disadvantages of resistance thermometers

for microclimatology a small copper-constantan thermo-element was developed and is described; its error is about 0.2°C. *Subject Headings:* **1. Thermocouples 2. Temperature measurement.**—*C.E.P.B.*

4.3–55 551.508.29:551.524.7

Myers, R. F. (*Oak Ridge, Tenn.*), **A low-level temperature sounding system for routine use.** *American Meteorological Society, Bulletin*, 33(1):7–12, Jan. **1952.** 8 figs., 4 refs. **MH-BH**—The sounding apparatus introduced in this article was designed under the requirements of ruggedness and facility for operation by one man. Technical details of the system are described and illustrated. Data furnished by the instrument, their routine evaluation and errors in accuracy are discussed and represented in tables and graphs. The apparatus is claimed to be capable of an accuracy of 0.06°F within the range of −40°F to 110°F, and of reaching altitudes of 1000 to 1500 ft. *Subject Headings:* **1. Temperature sounding apparatus 2. Temperature profiles.**—*G.T.*

4.3–56 551.508.29

Quigley, Henry C. (*Dupont, Wilmington, Del.*), **Resume of thermocouple checking procedures.** *Instruments*, Pittsburgh, 25(5):616–622, May **1952.** 5 figs., 3 tables. **MH-BH**—Various techniques of checking and calibrating industrial thermocouples (especially those which may have deviated from their original accuracy owing to various detrimental conditions) are suggested and discussed in two main groups: calibration by comparison with calibrated standards and calibration at fixed points. A table of the properties of 4 common types of thermocouples, a table of recommended calibration procedures and diagrams of a drilled block furnace, of bath checking facilities and of freezing-point, melting-point and boiling-point apparatuses are presented. *Subject Headings:* **1. Thermocouples 2. Calibration of instruments.**—*G.T.*

4.3–57 551.508.29

Rizika, Jack W. and Rohsenow, Warren M. (*Mass. Inst. of Technology*), **Thermocouple thermal error.** *Industrial and Engineering Chemistry*, 44(5):1168–1171, May **1952.** 3 figs., 5 refs., eqs. **DWB**—A theoretical analysis of the accuracy of thermocouples is developed through a series of equations and graphs accounting for temperature of the atmosphere, of the fluid, of the thermocouple junction and of the thermocouple at a certain distance from the junction, for length of the thermocouple system and of its part immersed in the fluid and for the perimeter of the thermocouple system. *Subject Headings:* **1. Thermocouples 2. Instrument accuracy.**—*G.T.*

4.3–58 551.508.29

Staley, Raymond C. (*Univ. of Texas, Austin*), **Performance characteristics of Sanborn rod thermistors.** *American Meteorological Society, Bulletin*, 33(2):67–72, Feb. **1952.** 4 figs., 4 tables, 10 refs. **MH-BH**—Methods for determining the accuracy of compensation, stability, time lag and shielding from solar and long wave radiation of the Sanborn rod thermistor, which is used to measure air temperature, are described. It is shown that with suitable compensation methods, with amplifying, recording and shielding techniques and with yearly calibration errors in the measurement of temperature, the field may be limited to about 0.4°C. *Subject Heading:* **1. Sanborn rod thermistors.**—*I.L.D.*

4.3–59 551.508.822

Canada. Meteorological Division, **Gill low pressure hydrogen generator; installation and operation manual.** *Canada. Meteorological Division Cir.*, 2075, Rad. 49, March 6, **1952.** 19 p. 2+figs. **DWB**—A low pressure generator designed by G. C. Gill for the purpose of generating hydrogen for radiosonde balloons is described. The manual includes a description of chemical reactions in the instrument, a complete list of parts of the generator, detailed instructions regarding installation, operation, cleaning and maintenance and diagrams showing every detail of the apparatus. The generator operates at a pressure of less than 4 pounds/sq. in. and thus the danger inherent in the operation of high-pressure generators is eliminated. It is able to supply 150 cu. ft. of hydrogen in 20 min. and can be re-charged immediately. *Subject Headings:* **1. Hydrogen generators 2. Radiosonde balloon inflation.**—*G.T.*

4.3–60 551.508.94:551.594.1(45)

Accardi, Luigi (*Inst. of Terr. Physics, Univ. of Naples*), **Nuovo apparecchio per la registrazione del campo elettrico atmosferico.** [New apparatus for recording the electric field of the atmosphere.] *Geofisica Pura e Applicata*, 22(1/2):84–86, Jan./Mar. **1952.** 3 figs. Italian and English summaries p. 84. **MH-BH**—Device which has been installed on the terrace of the Institute for Geophysics of the University of Naples since Sept. 1950 is described and illustrated, and samples of records shown. The instrument records both positive and negative fields, is highly sensitive, does not alter the field by its presence, records equally well during rainy weather as it contains a collector which does not alter the electric charge, gives a continuous record on a chart, and operates with alternating current. One disadvantage is sensitivity to local industrial smoke. *Subject Headings:* **1. Atmospheric electricity instruments 2. Atmospheric electricity measurement 3. Naples, Italy.**—*M.R.*

4.3–61 551.508.94:551.507.352

Coronity, S. C., Parziale, A. J., Callahan, R. C. and Patten, R., **Effect of aircraft charge on airborne conductivity measurements.** *Journal of Geophysical Research*, 57(2):197–205, June **1952.** 6 figs., 9 refs. **MH-BH** –The influence of charge on an aircraft on airborne conductivity measurements has been investigated. The results of experiments carried out in the laboratory and on aircraft are presented and analyzed. It was found that if the ions under investigation were disturbed only by charge on the air intake to the measuring condenser, then the measured conductivity was a simple function of the electric field at the intake. The conditions under which this simple relation no longer holds are also discussed. Charges large enough to introduce errors in measurements are present in fair weather while an aircraft is ascending and in ordinary clouds and mist. The analysis is applicable to any aircraft or balloon experiments where ion content or charge distribution is to be determined. *Subject Heading:* **1. Atmospheric electricity instruments.**—*Authors' abstract.*

4.3–62 551.508.94

Kasemir, Heinz W., **An apparatus for simultaneous registration of potential gradient and air-earth current. (Description and first results.)** *Journal of Atmospheric and Terrestrial Physics*, 2(1):32–37, **1951.** 5 figs., 5 refs. **MH-BH**—A portable instrument, with a 1-stage d.c. amplifier, a grid-leak resistor and high insulation is described and circuit diagram shown. Potential gradient is picked up by a radioactive collector controlling a grid; recorder covers practically all variations. Diurnal variations are recorded automatically. Air-earth current is picked up by a metal plate at ground level on which a variable a.c. is superposed. Sensitivity is regulated by changing grid-leak resistance. Four other channels are available for meteorological elements. Records on Nebelhorn and Zugspitze are illustrated. *Subject Heading:* **1. Atmospheric electricity instruments.**—*C.E.P.B.*

4.3–63 551.508.94:551.594.11

Reiter, Reinhold, **Ein einfaches, universelles Gerät für luftelektrische Messungen und seine Anwendungsmöglichkeiten.** [A simple universal apparatus for measurements of atmospheric electricity and possibilities of application.] *Geofisica Pura e Applicata*, 20:157–176, July–Dec. **1951.** 10 figs., 9 refs., eqs. In German, German and English summaries p. 157. **MH-BH**—A simple apparatus is described for measuring and recording the following data: 1) vertical atmospheric current; 2) atmospheric potential gradient (using a "half-static" method); 3) frequency and shape of fast changes of the atmospheric potential gradient (at times of electric discharges in the atmosphere). The apparatus consists of a specially devised tube-voltmeter, combining current supply and reading instrument in one housing. Various error limits of the method are discussed. Potential gradients may be measured up to ± 1500 volts per meter. Special investigations showed the wind velocity to have no influence on the measurements. Ten days' comparative records of this apparatus and the Benndorf-electrometer of the Fürstenfeldbruck Geomagnetic Observatory showed complete identity of curves. Several examples of results obtained with the new instrument are given. Simultaneous records of atmospheric potential gradients at various places showed good agreement of curves obtained under similar meteorological conditions. Graphs of average daily variations during the

months of 1949 and 1950 are also given. *Subject Headings:* **1. Atmospheric electricity instruments 2. Atmospheric electricity measurement 3. Potential gradient.**—*Author's abstract.*

4.3–64 551.508.94:551.594.11

Wichmann, Heinz, **Die Messung des luftelektrischen Feldes mit radioaktiven Potentialsonden.** [The measurement of the atmospheric electric field with radioactive potential sondes.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 5(1):86–99, **1952.** 15 figs. German, English, French summaries p. 86. **DWB**—The errors of the radioactive potential sonde due to variations of isolation, wind velocity and activity of the α-particle radiator are examined. To measure field with an electrometer a resistance of 10^{14} Omega is necessary, but at night and in winter with high humidity it may fall to 10^{12}. Methods of improving technique are discussed. *Subject Heading:* **1. Atmospheric electricity instruments.** —*C.E.P.B.*

4.3–65 551.508.98:551.586(432.2)

Koch, Horst Günther, **Vergleichende Terminmessungen der Abkühlungsgrösse mit Katathermometern in Thüringen 1947–51.** [Comparative regular measurements of the rate of cooling with katathermometers in Thüringia, 1947–51.] *Angewandte Meteorologie,* 1(7):203–211, Oct. **1952.** 3 figs., 11 tables, 10 refs. **MH-BH**—Observations with dry and wet Hill katathermometers 3 times daily at 10 stations are summarized, discussed and compared with earlier observations and with values calculated from air temperature and wind speed by formulas of Hill and Büttner. Differences are mostly due to radiation and strong wind. Variations with height above sea, 100–900 m, are shown in relation to wind and temperature and exposure at individual stations. *Subject Headings:* **1. Katathermometers 2. Cooling power 3. Thuringia, Germany.**—*C.E.P.B.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Physical mathematical bases of numerical integration in baroclinic atmos.** (Hinkelmann, Essenwanger, Reymann, Wippermann), 4.3–8; **Agrometeorology, Poland** (Molga), 4.3–21; **Kinematic vortex theory applied to motion of anomalies of general circulation** (Clapp), 4.3–117; **Mixing clouds in limited layer over Po Valley** (Gazzola), 4.3–208; **Techniques in snow melt forecasting** (Wilson), 4.3–239; **Bibliography on frost forecasting,** p. 337–397.

4.3–66 551.509

Hornstein, R. A. (*Dominion Public Weather Office, Halifax*), **Public weather program in a Dominion Public Weather Office.** *Royal Meteorological Society, Canadian Branch* [*Publications*], 3(4):1–7, May 1, **1952. DWB**—In this popular lecture the speaker touches on a few problems connected with daily forecasts (determination of regional boundaries of forecast areas, specification of terminology, consideration of demand for special weather information), with climatological services (monthly and annual summaries distributed to subscribers) and with public relations (occasional callers in need of *ad hoc* information). The Canadian Meteorological Service operates in 75 inland regions and 31 marine forecast areas (which were established in 1946). *Subject Headings:* **1. Weather forecasting 2. Public relations 3. Dominion Public Weather Office, Halifax, Nova Scotia.**—*G.T.*

4.3–67 551.509

McCormick, D. G. (*Hamilton Weather Office, Hamilton, Ontario*), **The role of the Hamilton Weather Office.** *Royal Meteorological Society, Canadian Branch* [*Publications*], 3(4):8–14, May 1, **1952. DWB**—Results achieved by the Hamilton (Niagara Peninsula, Canada) Weather Office during the first year of its operation in one of the most intensive fruit-growing districts of Canada are described by the meteorologist in charge of the office. Main objective of the office is to prepare personalized special weather forecasts meeting the needs of agriculture and industry (fruit-spray forecast, frequency and duration of "wetting period," "grass minimum temperature," frost forecast, prediction of snowfall amount). The office receives its information from the Malton Meteorological Office and completes it from reports of local ob-

servers. A close co-operation with local press and radio serves as an effective means of communication of reports and as an instrument for improving the public's meteorological knowledge. *Subject Headings:* **1. Weather forecasting 2. Agricultural meteorology 3. Weather broadcasting 4. Hamilton Weather Office, Hamilton, Ontario.**—*G.T.*

4.3–68 551.509.1(263)

U. S. Weather Bureau, **Caribbean Meteorological Broadcast (CARMET).** Washington, D. C., April 1, **1952.** 11 p. fig. **DWB**—A complete schedule of "CARMET" broadcasts of the station WBR, Miami, Fla., which have been transmitted on an experimental basis since August 1951. This sub-continental, international radioteletypewriter broadcast has been established with a view toward providing offices in the Caribbean Islands with rapid weather information. The bulletins consist of hourly airway weather reports, 24-hour forecasts, 16- and 24-hour route and terminal forecasts, advisories and warnings, surface analyses, surface reports for primary synoptic periods and pilot balloon, radiosonde and reconnaissance flight reports. *Subject Headings:* **1. Weather broadcasting 2. Synoptic reports 3. Miami, Fla. 4. Caribbean Area.**—*G.T.*

4.3–69 551.509.1:621.8(492)

van der Ham, C. J., **Het weer in beeld op het televisiescherm.** [The weather depicted on the television screen.] *Hemel en Dampkring*, 50(6):110–111, **1952.** fig. **DLC**—Brief note on the weather program which has been transmitted, in a tentative form, over the Dutch television network since Oct. 1951. In preference to the British method of presenting an inanimate weather map while the weather report is read, a simple type of animation has been chosen, similar to that applied in various American programs. In addition to these animated weather maps, the transmission of cloud pictures and some other unspecified projects are planned for the future. A photograph of a television screen showing a reporter and weather map is presented. Duration of the weather reports is three minutes. *Subject Headings:* **1. Television weather broadcasts 2. Netherlands.**—*G.T.*

4.3–70 551.509.1

Varley, Eric G., Hunnard, J. W. A., **Weather forecasts in the B.B.C. Home Service programme.** *Weather*, 7(2,5):62, 154–155, Feb., May **1952. DWB**—VARLEY advocates later broadcasts and inclusion of description of general synoptic situation. HUNNARD supports proposal for broadcast at 2055 hrs. *Subject Heading:* **1. Radio broadcasts.**

4.3–71 551.509.1:621.396.91

Wüsthoff, P., **Wetternachrichtendienst in der US-Zone, ein Rückblick und Ausblick.** [Weather Service in the US-Zone, retrospect and prospect.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:382–385, **1952.** 2 figs. **DWB**—The development between April 1946 and April 1952 includes a rapid expansion of the teleprinter service and of distribution and scope of forecasts. A survey of the latest methods suggests probable future developments. *Subject Headings:* **1. Communication networks 2. Germany.**—*C.E.P.B.*

4.3–72 551.509.2

Richard, Roméo, **The weather pylon.** *Weather*, 7(7):221, July **1952.** 2 photos. **DWB**—A stainless steel beacon in Toronto giving visual light signals indicating weather forecasts. *Subject Heading:* **1. Forecast dissemination.**—*C.E.P.B.*

4.3–73 551.509.21(26)

Rodewald, Martin, **Das Zeichnen der Bordwetterkarte nach Funk-Analysen.** [Drawing the ship's weather chart from wireless analyses.] *Wetterlotse*, 42:126–128, Aug. **1952.** fig. **DLC**—Instructions on drawing isobaric charts; 5 mb isobars are recommended. *Subject Headings:* **1. Synoptic charts 2. Marine forecasting.**—*C.E.P.B.*

4.3–74 551.509.21:551.542

*South Africa. Weather Bureau, **Tables and charts of Southern Hemisphere sea-level pressure.** *South Africa. Weather Bureau, Notos*, 1(1):23–64, **1952.** mostly tables, 4 charts.

DWB—An important step ahead for studies of general circulation. The Weather Bureau of the Union of South Africa has extended its daily weather maps since Jan. 1, 1951 to cover the whole Southern Hemisphere. There is a time-lag of about one year between the synoptic data and the final completion of the analysis. The synoptic coverage is fairly good, generally. No observations were available to the west of South America (80°–100°W) and in the Malay Archipelago and for the interior of the Antarctic continent. Tables of the daily and mean monthly pressure at fixed grid points (each 5° latitude and 10° longitude) and charts of mean monthly and seasonal pressures are presented for the first three months of 1951 and the summer season, Dec. 1950 to Feb. 1951, respectively. *Subject Headings:* **1. Pressure distribution 2. Daily weather maps 3. Southern Hemisphere.**—*A.A.*

4.3–75 551.509.3:551.509.5(73/9)

Thompson, J. C. (*U. S. Weather Bureau, Wash., D. C.*), **Applied research in weather forecasting.** *American Meteorological Society, Bulletin*, 33(5):195–198, May **1952. MH-BH**—The objectives of forecasting research are: 1) the systematization of forecasting procedures, 2) developing better methods for presenting forecasts and thereby measuring their usefulness and 3) raising the accuracy of prediction. The author discusses various methods for attaining these aims. *Subject Headings:* **1. Forecasting techniques 2. Forecast verification 3. United States.**—*I.L.D.*

4.3–76 551.509.3

U. S. Weather Bureau, **Weather forecasting.** Washington, D. C., **1952.** 39 p. 17 figs. table. Price: 20¢. **DWB**—A complete revision and modernization has been made by MR. I. R. TANNEHILL (Chief of U. S. Weather Bureau Forecast Div.) of the popular *U. S. Weather Bureau Bulletin*, No. 42, which by 1940 had gone through 6 editions. "The purpose is to present for general information the elementary principles of weather forecasting and basic facts and theories which are essential for an understanding of forecasting methods." Several brief chapters include charts, diagrams and illustrations of physical and chemical properties of the atmosphere and discussions of humidity, hydrometeors, circulation, fronts, sample synoptic weather maps, forecasting techniques, etc. *Subject Headings:* **1. Weather forecasting. I. Tannehill, Ivan R.**—*G.T.*

4.3–77 551.509.312:551.547

Dahler, Hermann, **Eine neue Formel für die Änderung der relativen Topographie durch Advektion.** [A new formula for the change of the relative topography by advection.] *Meteorologische Rundschau*, 5(5/6):87–90, May/June, **1952.** 3 figs., 3 refs., 15 eqs. **MH-BH**—S. WEBER's formula (*see item* 2.7–48, July 1951, *MAB*) is criticized and a different expression derived. An approximate form is:

$$\left|\frac{\partial Ha}{\partial t}\right| \geqq \left| -\left(\frac{v_1+v_2}{2}\right)^2 \cdot \frac{\alpha}{10^5}\right|$$

Ha is change of thickness m/sec, v_1, v_2 wind vectors at top and bottom of layer, α is angle between them (radians). Equality sign applied when $v_1 = v_2$. *Subject Headings:* **1. Relative topography 2. Advection 3. Differential kinematics.**—*C.E.P.B.*

4.3–78 551.509.312

Lingelbach, Ernst, **Wird die Meteorologie eine exakte Wissenschaft?** [Will meteorology become an exact science?] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:7–9, **1952.** 7 refs. **DWB**—The problem of weather forecasting by mathematical physics, attempted by V. BJERKNES and L. F. RICHARDSON, is being taken up again with new methods of calculation. The difficulties and the changes of practice involved are briefly discussed. *Subject Heading:* **1. Mathematical forecasting.**—*C.E.P.B.*

4.3–79 551.509.312:551.511

Sawyer, J. S. and Bushy, F. H., **Note on the numerical integration of the equations of meteorological dynamics.** *Tellus*, 3(3):201–203, Aug. **1951.** 6 refs., 2 eqs. **MH-BH**—The one-dimensional method of CHARNEY (*see item* No. 2.8–35, Aug. 1951, *MAB*) for computing

the change on the 500 mb height profile, applied to 60 charts, yields a correlation coefficient of +0.54 between predicted and observed height changes along lat. 50°N and +0.35 along lat. 40°N in winter. The success is less than that obtained by conventional forecasting and the failure of the predicted changes is analyzed. Numerical calculations to evaluate the vertical velocities in baroclinic development made with SUTCLIFFE's model indicate that the latter can provide a successful basis for forecasting. *Subject Headings:* **1. Mathematical forecasting 2. Upper air pressure.**—*I.L.D.*

4.3–80 551.509.312:551.511:551.543

§Stockholm, University. Institute of Meteorology, **Preliminary report on the prognostic value of barotropic models in the forecasting of 500 mb height changes.** *Tellus*, 4(1):21–30, Feb. **1952.** 2 tables, 6 refs. **MH-BH**—Efforts to improve the two-dimensional barotropic model for forecasting with high-speed computers, must precede attempts to develop a 3-dimensional model (considering the vorticity equation). Considerable smoothing results from the 3 differentiations of the initial contour field but that doesn't matter because two integrations are performed, thus eliminating inaccuracies and random errors. Computed and actual tendencies for test area (NW Europe and N Atlantic) gave average correlation of 0.7 with best correlation (0.92) over Scotland and 0.6 where aerological reports are wanting (near boundaries of area). Results encourage use of conservation of vorticity as prime factor in producing pressure changes over short periods in broad regions. *Subject Headings:* **1. Numerical forecasting 2. Barotropic models 3. Pressure change charts 4. Northwestern Europe. I. Charney, Jule G.**—*M.R.*

4.3–81 551.509.317:551.513.2

Riehl, Herbert (*Univ. of Chicago*) and Jenista, C. O. (*U. S. Air Force*), **A quantitative method for 24-hour jet-stream prognosis.** *Journal of Meteorology*, 9(3):159–166, June **1952.** 14 figs., 8 refs., 5 eqs. **DWB**—An isotach is propagated downstream at rate $c_i = v + g(\Delta h/\Delta v)$ where h is height of isobaric surface and v is wind speed. The last term is generally negative and a nomogram is given for calculating retardation. From this and prognoses of the contour field at 300 mb, 257 prognoses over U. S. were made; examples are shown. Wind direction verified within 20° in 75% and wind speed within 30% in 66 cases. Life history of centers of maximum wind speed is also discussed. *Subject Heading:* **1. Jet stream forecasting.**—*C.E.P.B.*

4.3–82 551.509.39:551.574.7

Appleman, H. (*U. S. Air Weather Service, Wash., D. C.*), **The forecasting of jet aircraft condensation trails.** *Aeronautical Engineering Review*, 11(8):30–32, Aug. **1952.** 2 figs. **DLC**—Aerodynamic and exhaust trails are defined and a system of forecasting the latter outlined in which their formation is shown to be a function of pressure, temperature and relative humidity of the environment. *Subject Headings:* **1. Exhaust trails 2. Condensation trail forecasting 3. Aeronautical meteorology.**—*M.P.K.*

WEATHER CONTROL

4.3–83 551.509.6

Flohn, Hermann, **Künstliche Beeinflussung von Wetter und Klima?** [Artificial influencing of weather and climate?] *Geographische Rundschau*, 4(2):47–52, Feb. **1952.** 17 refs. **DLC**—This general article discusses the processes of rain formation and the possibility of causing it, the effect of great town fires during the war, atom bomb explosions, Russian hydrologic plans and effect of Gulf Stream. The possibility of large scale artificial changes of climate is minimized, though recent warming of Arctic may be partly due to CO_2 from coal burning. Artificial changes of local climate by towns, forests, etc. undoubtedly occur. *Subject Headings:* **1. Artificial precipitation 2. Weather control.**—*C.E.P.B.*

4.3–84 551.509.67

Behrman, Daniel, **Is artificial rain possible in the parched lands of Baluchistan?** *United Nations Educational, Scientific and Cultural Organization, Courier*, 5(7):11, July **1952.** 2 illus. **DWB**—Brief account of the activities of the Meteorological Department of the Government of

Pakistan, which is supported by UNESCO. Particular attention is given to the research conducted by Dr. Edward Fournier d'Albe (London), UNESCO representative and cloud physicist at the Meteorological Station of Quetta. Purpose of his investigation is to determine possibilities of artificial stimulation of rain in Pakistan. The station is equipped with simple homemade instruments, including a cascade impactor. *Subject Headings:* **1. Artificial precipitation 2. Arid zones 3. Pakistan. I. Fournier d'Albe, Edward.**—*G.T.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

STRUCTURE OF THE ATMOSPHERE

See also: **Formulae of intensity and number of photons in UV solar radiation in upper atmos.** (Gauzit), 4.3–141; **Ionospheric wind heights measured at long radio waves** (Jones, Millman and Nertney), 4.3–185; **Southward shifting of auroral zone** (Takesi), 4.3–290.

4.3–85 551.510.3:551.510.53:551.547

Doporto, Mariano (*Met. Serv., Ireland*), **The isopycnic level and the coupling of tropopause and surface waves.** *Annales de Géophysique*, Paris, 7(4):256–261, **1951.** 5 figs., 2 tables, 5 refs. English and French summaries p. 256. **MH-BH**—By computing the correlation coefficient between the pressure at the ionopycnic level and the difference of pressures at the surface and the isopycnic level, staggering one of the series relative to the other, the period of difference of phase of simple periodicities can be determined. There is evidence that both period and phase of any such periodicities are not constant. *Subject Headings:* **1. Isopycnic level 2. Periodicities 3. Tropopause 4. Upper air pressure.**—*Author's abstract.*

4.3–86 551.510.41:551.510.53:546.17

Deb, S., **Nitrogen in the upper atmosphere.** *Journal of Atmospheric and Terrestrial Physics*, 2(6):309–323, **1952.** 3 figs., 5 tables, 17 refs., 21 eqs. **DWB**—The probable distribution of atomic nitrogen in the upper atmosphere is calculated, assuming dissociation by solar radiation in the ranges 1150–1250 Å (G. and L. Herzberg) and below 795 Å (Mitra). The first is effective between 70–170 km with a sharp maximum of about 1% at 90 km; the second gives a continuous increase from 200–400 km with a maximum of 2–7%, depending on the estimated radiative recombination and the maintenance of equilibrium (unlikely at such high levels). In the higher regions recombination is small enough to account for the observed twilight flash of negative bands of N_2^+ ions when the exosphere is illuminated by the sun. *Subject Headings:* **1. Atmospheric composition 2. Upper stratosphere 3. Nitrogen.**—*C.E.P.B.*

4.3–87 551.510.41

Nielsen, Alvin H. and Migeotte, Marcel (*Univ. of Liège, Belgium*), **Abundance and vertical distribution of telluric methane from measurements at 3,580 meters elevation.** *Annales d'Astrophysique*, Paris, 15(2):134–141, **1952.** 3 figs., 2 tables, 3 refs. **DWB**—From the observations on the equivalent width of lines 0–1, 5–6 and 10–11 of 2 ν_3 in telluric methane, made at the Jungfraujoch, the total number of methane molecules above the Jungfrau has been calculated in a manner suggested by Goldberg (*see item* 3.7–80, July 1952, *MAB*). It has been shown that this value is consistent with his conclusion, based on observations at Mount Wilson and Lake Angelus, that the methane decreases exponentially with the main body of the atmosphere. As a consequence of all these observations the belief that methane is distributed throughout the world is substantiated. *Subject Headings:* **1. Methane 2. Atmospheric composition 3. Jungfrau, Switzerland.**—*Author's abstract.*

4.3–88 551.510.41:92

Partington, J. R., **Sir William Ramsay (1852–1916).** *Nature*, London, 170(4327):554–555, Oct. 4, **1952.** **DWB**—Ramsay, born Oct. 2, 1852, was a chemist of international reputation. He reported the discovery of argon in the atmosphere in 1895, helium, neon, krypton and xenon in 1898. *Subject Headings:* **1. Atmospheric composition 2. Biography 3. Ramsay, Sir William.**—*C.E.P.B.*

4.3–89 551.510.41:546.214(798)

Wilson, Wm. S., Guenther, Wm. B., Lowrey, Robert D. and Cain, Joseph C., **Surface ozone at College, Alaska, for the year 1950.** *American Geophysical Union, Transactions*, 33(3):361–364, June 1952. 2 figs., table, 7 refs. **MH-BH** —The daily average concentrations of ozone in the atmosphere near the surface at College, Alaska (lat. 65°N, long. 148°W), were determined during 1950 by the absorption of ozone in a solution of potassium iodide and standard sodium arsenite. The results, which were generally higher and more erratic than those found at lower latitudes, ranged from one to 75 mg/100 m^3 of dry air at standard conditions to give a yearly average of 9.8 mg/100 m^3 (or 4.6×10^{-8} molecules of ozone per molecule of air). The monthly averages showed a principal maximum in April, a secondary maximum in July and a minimum in August. *Subject Headings:* **1. Ozone measurement 2. College, Alaska.**—*Authors' abstract.*

4.3–90 551.510.42:58

Gregory, P. H., **Spore content of the atmosphere near the ground.** *Nature*, London, 170(4325):475–477, Sept. 20, 1952. table, 6 refs. **DWB**—The disadvantages of surface traps are emphasized. The cascade impactor of K. R. May was used for series of 6 consecutive 4-hour runs in the open at Rothamsted, at a height of 2 m. The table gives the numbers of different spores per m^3 on June 10–14, 1952. *Subject Heading:* **1. Aerobiology.**—*C.E.P.B.*

4.3–91 551.510.42:551.508.91

Hall, Stanley R. (*Chemical Lab., Glendale, Calif.*), **Evaluation of particulate concentrations with collecting apparatus.** *Analytical Chemistry*, Washington, D. C., 24(6):996–1000, June 1952. 2 figs., table, 13 refs. **DLC**—A method of evaluating density of air pollution by means of the reflectance of samples collected by an autosampler on a paper filter from a known volume of air is described. Samples obtained by this method are illustrated and values of their chemical components tabulated. Curves of correlation between meteorological elements and corresponding particulate quantities are presented. The effect of humidity changes on visibility is graphically represented. *Subject Headings:* **1. Atmospheric pollution 2. Air sampling instruments 3. Air sampling and analysis.**—*G.T.*

4.3–92 551.510.42:628.53

*Lowry, Philip H., Mazzarella, Daniel A. and Smith, M. E. (*Brookhaven Natl. Lab.*), **Ground-level measurements of oil-fog emitted from a hundred-meter chimney.** *Meteorological Monographs*, Boston, 1(4):30–35, Nov. 1951. fig., 2 tables, 3 refs. **MH-BH**—The meteorological control program instituted at Brookhaven National Laboratory in 1947 includes a complete study of dispersion from an elevated source by means of an oil-fog test effluent. Measurements of oil-fog concentrations at ground-level have been made during a wide variety of meteorological conditions. The data accumulated in the first forty-six tests are summarized in this paper, together with pertinent meteorological information. A brief description of terrain, facilities, and procedure is also included. *Subject Headings:* **1. Industrial meteorology 2. Stack effluents 3. Oil fog. I. Brookhaven National Laboratory.**—*Authors' abstract.*

4.3–93 551.510.42:551.556

*Lowry, Philip H. (*Brookhaven Natl. Lab.*), **Microclimate factors in smoke pollution from tall stacks.** *Meteorological Monographs*, Boston, 1(4):24–29, Nov. 1951. 6 figs., 3 tables, 6 refs. **MH-BH**—A good approximation to the maximum ground concentration, averaged over an hour, may be found from the continuous record of a single anemometer and wind vane mounted at the level of the chimney-top, if nonmeteorological factors such as the nature of the terrain and the conditions of emission are neglected. A classification of the lateral gustiness, as determined from the wind direction trace, combined with the mean hourly wind speed and direction suffice to determine the correction factor which should be applied to O. G. Sutton's equation for the maximum ground concentration in order to determine its hourly mean value and its distribution in direction. An empirical rule is also given for determining the horizontal distance of the maximum ground concentration. The correction factor, am, is combined with the mean hourly wind speed to give an index of pollution intensity which can be called the smoke-hour. The results of the method check closely with concentration measurements

made at the Brookhaven National Laboratory. *Subject Headings:* **1. Smoke 2. Stack effluents 3. Wind effects 4. Smoke diffusion. I. Brookhaven National Laboratory.**—*Author's abstract.*

4.3–94 551.510.42:061.3

U. S. Public Health Service, **The Detroit-Windsor Air Pollution Study.** *U. S. Public Health Service, Public Health Reports*, 67(7):658–671, July 1952. **DWB**—Six papers submitted to a symposium jointly sponsored by the American Conference of Governmental Industrial Hygienists and the American Industrial Hygiene Association and held on April 22, 1952 during the Industrial Health Conference at Cincinnati, Ohio, are presented. Subject of the symposium was the Detroit-Windsor Air Pollution Study conducted by an international joint commission of the U. S. and Canada. Objectives of the project, such as statistical analyses and environmental studies, are outlined and various aspects of the problem considered. General information on the project is included in an article by GEORGE D. CLAYTON, chairman of the American section. Meteorological aspects are discussed by HAROLD W. BAYNTON of the Met. Service of Canada. *Subject Headings:* **1. Atmospheric pollution studies 2. Conferences. I. Industrial Health Conference, Cincinnati, April 1952 II. Clayton, George D. III. Baynton, Harold W.**—*G.T.*

4.3–95 551.510.52:551.543

*Flohn, Hermann, **Mittlere Druck- and Strömungverhältnisse in der Troposphäre. [I] Sommer. [II] Winter.** [The mean pressure and air streams in the troposphere. (Pt. I) Summer. (Pt. II) Winter.] *Germany. Deutscher Wetterdienst in der US-Zone, Grosswetterlagen Mitteleuropas*, 2:61–64, 105–107, **1949.** charts. Abstracted from reprint. **DWB**—One of the results of the author's intensive work in the meteorology and climatology of the free atmosphere. Mean charts are presented for a great part of the Northern Hemisphere (North America, Atlantic, Europe from 90°N to 30–20°N, Asia and Pacific to 50–45°N) showing the relative topography, temperatures and wind directions of the 500 mb surface. Other charts from 110°W to 70°E present the absolute topography, temperatures and wind directions for 700 mb and 225 mb. The values are arranged for 3 summer and 3 winter months. All available data are used. A discussion of the accuracy of the different kinds of ascents is given. The cold pole of the free atmosphere is found over the Baffin Island in summer and over Northeast Siberia in winter, accompanied by a second cold pole over the Canadian Archipelago. The influence of the North American continent results in a cold trough over the eastern coast and a warm crest over the western coast, very well expressed in summer. *Subject Headings:* **1. Atmospheric pressure 2. Relative topography 3. Troposphere 4. Cold poles 5. Northern Hemisphere.**—*A.A.*

4.3–96 551.510.53:551.524.7

Koteswaram, P. (*Met. Off., Santacruz Airport, Bombay*), **The thermal structure of the stratosphere over the tropics.** *Indian Journal of Meteorology and Geophysics*, 3(1):30–34, Jan. **1952.** 4 figs., 15 refs. **DWB**—Recent temperature measurements in the stratosphere over the tropics point out that there is no isothermal layer in the lower stratosphere in these regions. An examination of the mean height temperature curves, both for the Northern and Southern Hemispheres, indicates that the lower stratosphere to the poleward half of 45° exhibits a deep isothermal region, while that to the equatorial half does not. The transition in the Northern Hemisphere along 80°W meridian has been found to occur between 48 and 51°N in summer and between 38 and 42°N in winter and coincides with the transition of the tropopause pointed out by HESS. A similar transition has been found for the Southern Hemisphere. *Subject Headings:* **1. Temperature of the stratosphere 2. Upper air temperatures 3. Southern Hemisphere 4. Northern Hemisphere.**—*Author's abstract.*

4.3–97 551.510.534

Johnson, F. S., Purcell, J. D., Tousey, R. and Watanabe, K., **Direct measurements of the vertical distribution of atmospheric ozone to 70 kilometers altitude.** *Journal of Geophysical Research*, 57(2):157–176, June **1952.** 10 figs., 5 tables, 21 refs., 19 eqs. **MH-BH**—Atmospheric ozone was measured to an altitude of 70 km over the White Sands Proving Grounds,

New Mexico, on June 14, 1949. The data were obtained from a series of solar ultraviolet spectra photographs near sunset from two spectrographs installed in an Aerobee rocket. The ozone concentration above 35 km decreased approximately exponentially and was in good agreement with the concentration calculated from photochemical theory, provided that the three-body collision process $O+O+M \rightarrow O_2+M$ was considered. *Subject Headings:* **1. Ozone distribution 2. Ozone measurement 3. White Sands Proving Ground, New Mexico.**—*Authors' abstract.*

4.3–98 551.510.534

Miyake, Y. and Saruhashi, K., **On the annual and meridional variation of the atmospheric ozone.** *Papers in Meteorology and Geophysics*, Tokyo 2(2):150–157, June **1951.** 5 figs., table, 6 refs. **MH-BH**—By means of calculations it is shown that the total mass of ozone on the earth is almost constant, and that there is a seasonal variation in amount of ozone on each hemisphere but that the increase in one hemisphere is compensated by a decrease in the other. The photochemical formation of ozone decreases from the equator to the pole so that meridional flow brings about the actual distribution of observed ozone. The approximate velocities of the transport of ozone poleward are calculated for different latitudes and these are used to explain the seasonal and meridional distribution of ozone. *Subject Headings:* **1. Ozone distribution 2. Ozone variations.**—*I.L.D.*

4.3–99 551.510.534

Miyake, Y. and Saruhashi, K., **On the theory of annual variation and meridional distribution of ozone.** *Meteorological Society of Japan, Journal, 2nd Ser.*, 29(10):347–360, Oct. **1951.** 7 figs., 3 tables, 13 refs., 19 eqs. In Japanese, English summary p. 347. **MH-BH**—The authors assume that the distribution of ozone in the Northern and Southern Hemispheres is approximately the same only with half a year difference of phase. In this case the total mass of ozone is found always constant. The meridional distribution of photochemically formed ozone calculated theoretically and that observed are different. The authors consider that the actual distributions are formed secondarily by poleward transports of ozone in the stratosphere. Numerical values of the estimated velocity of poleward transport are given for each month. *Subject Headings:* **1. Ozone distribution 2. Ozone variations 3. Upper atmosphere.**—*A.A.*

4.3–100 551.510.534:523.38

Paetzold, H. K., **Schwankungen der vertikalen Ozonverteilung in 0° und 60° geographischer Breite nach Messungen bei Mondfinsternissen.** [Variations in the vertical ozone distribution in 0° and 60° lat. during lunar eclipses.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:292–294, **1952.** 2 figs., 15 refs. **DWB**—The height distribution of ozone in different latitudes can be estimated from the brightness distribution near the dark edge of lunar eclipses. Values in lat. 0° and 60° on several eclipses are plotted, showing great variations at heights of 30 km up. *Subject Headings:* **1. Ozone variations 2. Lunar eclipses.**—*C.E.P.B.*

4.3–101 551.510.534

Ramanathan, K. R., Moorthy, Bh. V. R. and Kulkarni, R. N., **The effect of secondary scattering in the calculation of the vertical distribution of atmospheric ozone from the Götz inversion-effect.** *Royal Meteorological Society, Quarterly Journal*, 78(338):625–626, Oct. **1952.** table, 6 refs. **DWB**—Calculation of vertical distribution of ozone from ratio of intensities of light from zenith sky at different zenith distances of the sun introduces errors if secondary scattering is ignored. Observations at Mt. Abu on wave lengths 3040–3200Å and 3240–3430Å are used to recalculate ozone distribution at different levels giving maximum day-to-day variation in layer 18–27 km. *Subject Heading:* **1. Ozone distribution.**—*C.E.P.B.*

UPPER ATMOSPHERE—IONOSPHERE

4.3–102 551.510.535:551.524.7:551.594.12

Lepechinsky, D., **Effects of temperature variations of the upper atmosphere on the formation of ionospheric layers.** *Journal of Atmospheric and Terrestrial Physics*, 1(5/6):278–285, 1951. 2 figs., 6 refs., 6 eqs. **MH-BH** It is shown that seasonal and diurnal behavior of the F2 layer is in accord with CHAPMAN's ion production theory, when temperature changes are taken into account. It is assumed that the effect of magnetic storms on this layer are essentially due to an abnormal heating subjected to photoionization. A temperature decrease effects an elevation of the region where ions are produced and a decrease of the rate of ion production. *Subject Headings:* **1. F2 layer 2. Upper air temperatures 3. Ion production theory. I. Chapman, Sydney.**—*A.A.*

4.3–103 551.510.535:550.385

Lindquist, Rune A., **A survey of recent ionospheric measurements at the Ionospheric and Radio Wave Propagation Observatory at Kiruna.** *Arkiv för Geofysik*, Stockholm, 1(2–4):247–266, 1951. 28 figs., 10 refs. **MH-BH**—Ionospheric research started at the Ionospheric and Radio Wave Propagation Observatory at Kiruna on October 1, 1948. This report gives some preliminary results obtained from the recordings during the period October 1948–August 1949. Different types of sporadic E echoes are classified and the diurnal and seasonal behaviour of Es is shown and discussed. The relation between E's and magnetic disturbances is further discussed. A few typical polar black-outs are described and studied. The diurnal and seasonal behaviour of the ordinary layers is also shown as a final bi-product. *Subject Headings:* **1. Ionospheric research 2. Sporadic E layer 3. Magnetic disturbances 4. Kiruna, Sweden 5. Ionospheric and Radio Wave Propagation Observatory, Kiruna, Sweden.** – *Author's abstract.*

4.3–104 551.510.535:551.557:550.385

Little, C. G. and Maxwell, A., **Scintillation of radio stars during aurorae and magnetic storms.** *Journal of Atmospheric and Terrestrial Physics*, London, 2(6):356–360, 1952. 3 figs., 6 refs. **DWB** –Scintillations of radio stars on 3.7 m during auroras of Sept. 25 and Oct. 28, 1951, averaged 4 or more per minute compared with 1–2 in normal conditions. On Oct. 28 a 10% decrease of signal intensity at maximum aurora. Scintillation rate also has high+correlation with geomagnetic K index. Records of receivers 3 km apart show that changes of fluctuation rate are due to changes in speed of passage of quasi-stable disturbances, which may be about 120 km across. During aurora, average wind speed in upper ionosphere was about 400 m/sec; changes in scintillation rate are due to changes in this velocity. *Subject Headings:* **1. Ionospheric variations 2. Ionospheric winds 3. Auroras 4. Magnetic storms.**—*C.E.P.B.*

4.3–105 551.510.535:523.75:550.38

McIntosh, Douglas Haig, **Geomagnetic solar flare effects at Lerwick and Eskdalemuir, and relationship with allied ionospheric effects.** *Journal of Atmospheric and Terrestrial Physics*, 1(5/6):315–342, 1951. 3 figs., 22 tables, 19 refs. **DWB**—The geomagnetic effects of solar flares (the crochets) over the period 1936–1949 are tabulated and identified. An equinoctial maximum of occurrence is observed. Midday is the hour of greatest frequency. The relationships between geomagnetic effects and flares, fade outs, sudden enhancements of sferics, etc. are examined. A general discussion of the phenomena is given. *Subject Headings:* **1. Terrestrial magnetism 2. Solar flares 3. Ionosphere 4. Sferics 5. Lerwick, Scotland 6. Eskdalemuir, Scotland.**—*A.A.*

4.3–106 551.510.535

Meek, J. H. (*Defense Res. Bd., Canada*), **Ionospheric disturbances in Canada.** *Journal of Geophysical Research*, 57(2):177–190, June 1952. 11 figs., 4 refs. **MH-BH**—Detailed analysis has been made of variations of F region ionization and of abnormally high absorption taking place during ionospherically disturbed periods at northern latitudes. It was found that the disturbance effect appears first in one part of the auroral zone and moves around the earth with the sun for several days. The effect of the disturbance is enhanced and extends farther

south near certain geographic latitudes. Diurnal and seasonal characteristics of the disturbances are described. It is suggested that the disturbances are connected with similar magnetic disturbances and are due to a narrow solar stream of particles moving into the earth's path. *Subject Headings:* **1. F layer 2. Ionospheric disturbances 3. Canada.**—*Author's abstract.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Physical mathematical bases of numerical integration in baroclinic atmos.** (Hinkelmann, Essenwanger, Reymann, Wippermann), 4.3–8; **Numerical integration of equations of meteorological dynamics** (Sawyer and Bushy), 4.3–79; **Prognostic value of barotropic models in forecasting 500 mb height changes,** 4.3–80; **Comparison between observed and computed winds for vorticity computations** (Hovmöller), 4.3–187.

4.3–107 551.511

Čadež, M., **O pretvaranju energije u atmosferi.** [Energy transformations in the atmosphere.] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik,* 2(1/2):1–8, **1949.** 11 eqs. 7 refs. In Serbian, Russian and French summaries p. 7–8. **DWB**—The absorption or emission of thermal energy is considered to be the source of the potential energy of atmospheric pressure distribution which becomes partially transformed into kinetic energy. An analytical method is developed for the quantitative computation of kinetic energy in horizontal and vertical air currents. The influence of the gravitation field in transforming the internal energy of air masses into kinetic energy of winds is accounted for. *Subject Headings:* **1. Energy transformation 2. Kinetic energy 3. Yugoslavia.**—*G. T.*

4.3–108 551.511:551.524.1

Demiańczuk, Piotr Pawel, **O zależności między temperaturą potencjalno-ekwiwalentą a temperaturą pseudopotencjalną w roznych masach powietrznych.** [On the relation between equivalent potential temperature and pseudo potential temperature in different air masses.] *Przegląd Meteorologiczny i Hydrologiczny,* 1950/1951:62–83, **1951.** 3 tables, numerous eqs. French summary p. 83. **DWB**—A discussion about the most accurate computation of the above mentioned temperatures based on various equations and formulas, compared with theories of Rossby and Kopcewicz. Articles from Berry, Bollay, and Beers "Handbook of meteorology" are also considered. *Subject Headings:* **1. Equivalent potential temperature 2. Pseudo potential temperature 3. Thermodynamics of the atmosphere 4. Temperature calculations.**—*Wanda Tomczykowski.*

4.3–109 551.511:551.524.3

James, R. W., **Heat diffusion from a plane, periodic source.** *Geofisica Pura e Applicata,* 22(3/4):174–188, April/June **1952.** 3 figs., table, 10 refs. **MH-BH**—The solution of the heat diffusion equation with a periodic, plane source is applied to problems of the diurnal and annual range of surface temperature and its lag on insolation. The application of diffusion theory to practical problems is much simplified by the introduction of the concept of a heat capacity for a surface source. Heat capacity may be calculated from the thermal characteristics of the diffusing substance, and the nature of the periodic source. Heat capacities so determined give diurnal surface temperature ranges of the order revealed in nature. It is possible to account for the way in which the annual temperature range changes with altitude. The annual temperature range computed on diffusion theory alone is about 250% in excess of observed values, but the discrepancy may be accounted for by the interlatitudinal exchange of heat. The indications are that in average circumstances the air absorbs 50%–100% more heat from a plane source than the soil. *Subject Headings:* **1. Heat diffusion 2. Temperature variations 3. Heat exchange.**—*Author's abstract.*

4.3–110 551.511:551.515

Schmidt, F. H., **On the theory of small disturbances in equatorial regions.** *Journal of Meteorology,* 6(6):427–428, Dec. **1949. MH-BH**—Solution of perturbation equations for application to waves or small disturbances in the tropics such as those which occasionally

affect Java during both the wet and dry seasons. These disturbances originate in the southern Indian Ocean and first appear in the vicinity of the Cocos Islands and tend to disappear as they approach the equator. Difficulties in the solution arise from great variation in the coefficients as the system goes from high to low latitudes. *Subject Headings:* **1. Perturbation equations 2. Easterly troughs 3. Tropical meteorology 4. Indonesia.**—*M.R.*

4.3–111 551.511

Stümke, H., **Rationelle Behandlung der Konvektion bei der angenäherten Berechnung der Wetterentwicklung.** [Rational treatment of convection in the approximate calculation of weather development.] *Meteorologische Rundschau*, 5(3/4):45–47, March/April 1952. fig., 9 eqs., 2 refs. **DWB**—Author introduces convection into his theory of atmospheric development (*see item* No. 2.7–74 July 1951, *MAB*). Mathematically the changes in air masses are represented as the activity of mass-dipoles and described by the source-sink method. Widespread irregular cellular convection in uniform air mass at rest is treated as a mean specific frequency; in a vertical gradient of horizontal velocity the impulse given in the ascending air implies a corresponding reaction term in the equations of motion. *Subject Headings:* **1. Dynamics of the atmosphere 2. Heat sources and sinks 3. Air mass modification.**—*C.E.P.B.*

4.3–112 551.511

Väisälä, Vilho (*Helsinki U., Inst. Met.*), **Entropy, adiabats and potential temperatures.** *Geophysica*, Helsinki, 4(1):4–13, **1951.** 2 refs., 25 eqs. **DWB**—The author proposes to use entropy as a primary conservative quantity, instead of the different "potential temperatures" used in synoptic investigations. The usefulness of the entropy is shown and the applications are discussed. *Subject Headings:* **1. Entropy 2. Vertical temperature gradient 3. Potential temperature.**—*A.A.*

4.3–113 551.511

Van Mieghem, Jacques (*Univ. of Brussels*), **Some remarks on the angular momentum balance in the atmosphere.** *Tellus*, 4(2):135–138, May **1952.** 7 refs., 10 eqs. **MH-BH**—*Subject Heading:* **1. Angular momentum balance.**

4.3–114 551.511:533.6

Watanabe, T., **A method of integration of the fundamental equation of dynamic meteorology.** *Journal of Meteorological Research*, Tokyo, 3(14/15):502–510, Dec. **1951.** 3 figs., 30 eqs. In Japanese, English summary p. (33). **MH-BH**—Assuming a homogeneous, incompressible and barotropic atmosphere, the equations of motion are described as follows: $\frac{\partial u}{\partial t}-Zv=-\frac{1}{\rho}\frac{\delta P}{\delta x}$; $\frac{v\partial}{\partial t}+Zu=\frac{1}{\rho}\frac{\partial P}{\partial u}$ where Z is vertical component of the absolute vorticity and P the total pressure. Therefore, when the wind field is stationary, there occur two cases: in the first case, $Z\neq 0$, the wind is gradient flow; in the second case, $Z=0$, the total pressure P is constant for all x and y. The latter relation determines the motion of an air particle. For example, in a case of circular concentric pressure field, from the above relation we have the following: $\frac{1}{r}\frac{\partial(rv\theta)}{\partial r}+\lambda=0$ and $P+\frac{\rho}{2}(v_r{}^2+v_\theta{}^2)=C(C,$ const.) or $v\theta=\frac{\Omega}{r}-\frac{\lambda}{2}r$, $\Omega=$const., v_r $=\pm\sqrt{\frac{2}{\rho}(C-P)-\left(\frac{\Omega}{r}-\frac{\lambda}{2}r\right)^2}$. The above solution can be applied to the unstationary wind field, and Ω and P is constant for the concerned air particle but not for all particles. From the relation $\zeta+\lambda=0$ for stationary virtual wind field, we derived the equation of air trajectory, inertia motion of a particle and absolute vorticity trajectory. It is explained how trajectories can be obtained by a semi-graphical method. *Subject Headings:* **1. Dynamic meteorology 2. Equations of motion 3. Japan.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **Antarctic atmos. circulation** (Court), 4.3–2; **Quantitative method for 24-hour jet stream prognosis** (Riehl and Jenista), 4.3–81; **Three dimensional disturbances in baroclinic zonal current** (Kuo), 4.3–122.

4.3–115 551.513(99)

Lamb, Hubert Horace, **The meteorology of the Antarctic.** *Geographical Journal*, 118(2): 33–235, June **1952. DWB**—Essay review of A. COURT, "Antarctic atmospheric circulation," n American Meteorological Society "Compendium of meteorology," 1951 (*see item* 4.3–2 above). *ubject Headings:* **1. Atmospheric circulation 2. Antarctica 3. Reviews. I. Court, Arnold.**—*.E.P.B.*

4.3–116 551.513:551.515

§Vowinckel, E., **The Southern Hemisphere circulation, Jan.–March 1951.** *South Africa. Veather Bureau, Notos*, 1(1):18–23, **1952.** 3 figs. **DWB**—General description, with sample naps, of selected synoptic situations. Probably will be a routine feature in the new periodical. *ubject Headings:* **1. Atmospheric circulation 2. Synoptic studies 3. Southern Hemisphere.**—*.A.*

4.3–117 551.513.1:551.513.7:551.509.312

Clapp, Philip F., **Kinematic vortex theory applied to the motion of anomalies of the eneral circulation.** *American Geophysical Union, Transactions*, 33(3):365–376, June **1952** figs., table, 10 refs. **MH-BH**—An attempt is made to apply the kinematic theory of vortex nteraction, as examplified by the von Kármán "vortex street," to the problem of forecasting ne motion of large-scale departure from normal centers as observed on Northern Hemisphere eather maps. The method has a small degree of success and points to some interesting haracteristics of atmospheric vortices such as the failure of two systems to affect each other trongly when approaching too closely. The resemblance of this method to the two-dimenonal numerical integration technique is pointed out, and suggests that the latter can be pplied to problems of long-range forecasting. *Subject Headings:* **1. Kinematic vortex theory . Atmospheric circulation anomalies 3. Numerical forecasting 4. Long range forecasting.** *–Author's abstract.*

4.3–118 551.513.1:551.524

Priestley, Charles H. B., **Heat transport and zonal stress between latitudes.** *International Union of Geodesy and Geophysics, Association of Meteorology, Oslo 1948, Transactions*, 2:148–150, **950.** 2 tables. Mimeographed. **DWB**—Data on northward eddy flow of sensible latent nd total heat flow and integrated total (Reynolds) stress are given for Larkhill (southern ngland) for the period January 1946 to June 1947. *Subject Headings:* **1. Heat transport . Eddy flux 3. England.**—*I.L.D.*

4.3–119 551.513.2:551.557

Prandtl, Ludwig, **Wettervorgänge in der oberen Troposphäre.** [Weather processes in ne upper troposphere.] *Akademie der Wissenschaften in Göttingen, Mathematisch-physikasche Klasse, Mathematisch-physikalisch-chemische Abteilung, Nachrichten*, No. 2:13–18, **1949.** figs., 4 refs. **DLC**—The author explains the formation of the jet stream by the lift of cloud nasses at a warm front. The jet stream appears polewards from the cloud belt. *Subject Teadings:* **1. Jet stream 2. Upper troposphere.**—*A.A.*

4.3–120 551.513.2:551.557(52)

Serebreny, S. M. (*Pan Amer. World Airways*), **Some preliminary considerations of the et stream over Japan.** *Pan American World Airways, Inc., Pacific Alaska Division, Technical Report*, No. 41, July **1951.** 29 p. 15 figs., table, 8 refs. **DWB**—Theoretical considerations n the general circulation show that strong jet streams must be developed on the east coasts of ontinents. A private company started an investigation of the jet stream over Japan where is found to be far more intense than anywhere else. For example, a wind velocity of 400

knots at 35,000′ height is found. The steadiness of winds above 10,000′ is extremely high (90–99%). The occurrence of winds (over 75 knots) is too frequent for economical operation of airplanes in east-west direction above 18,000 ft. Numerous cross sections for single days of wind velocity and actual and potential temperature are added, showing multiple jets. *Subject Headings:* **1. Jet stream 2. Cross sections 3. Japan.**—*A.A.*

ATMOSPHERIC DISTURBANCES

See also: **Studies of typhoon and convection** (Fujita), 4.3–4; **Storms and depressions, annual summary, India,** 4.3–41; **Theory of small disturbances in equatorial regions** (Schmidt), 4.3–110; **S. Hemisphere circulation, Jan.–March 1951** (Vowinckel), 4.3–116; **Warm front waves and dynamics of warm anticyclones** (Kruhl), 4.3–135; **pH concentration in precipitation in relation to frontal systems** (Barla), 4.3–217; **Comparative regional climatology** (Frisby and Green), 4.3–283.

4.3–121 551.515

James, R. W., **The latitude dependence of intensity in cyclones and anticyclones.** *Journal of Meteorology,* 9(4):243–251, Aug. **1952.** 6 figs., 3 tables, 5 refs., 7 eqs. **DWB**—Intensity of a cyclone is difference of central pressure from local normal. That of an anticyclone is given by area and profile. Potential and kinetic energy are both inversely proportional to square of Coriolis parameter. Migrating cyclones and anticyclones are nearly normally distributed with latitude, mean 45°, standard deviation 7½°. In low and mid latitudes, intensities increase linearly with sin ϕ; they are much greater in winter than summer. Mean mass of anticyclones is nearly constant with latitude; that of winter cyclones increases rapidly to a maximum in 60–65°. *Subject Headings:* **1. Structure of disturbances 2. Cyclones 3. Anticyclones.**—*C.E.P.B.*

4.3–122 551.515:551.513

Kuo, Hsiao-lan, **Three-dimensional disturbances in a baroclinic zonal current.** *Journal of Meteorology,* 9(4):260–278, Aug. **1952.** 10 figs., 18 refs., 121 eqs. **DWB**—The paper studies the vertical transport of zonal momentum in large scale disturbances in a baroclinic zonal current, and the vertical distribution of energy of perturbations. In Pt. 1 the partial differential equations are derived including effect of viscosity. In Pt. 2 it is shown that disturbances, shorter than a critical value, in a basic current are unstable and may double in amplitude in 24 hrs. Most of the kinetic energy of the perturbation is produced by the horizontal pressure gradient in the lower atmosphere. These disturbances cause a downward transport of momentum and a poleward transport of heat. An appendix sets out a special nonlinear differential equation for the pressure tendency. *Subject Heading:* **1. Zonal perturbations.**—*C.E.P.B.*

4.3–123 551.515:551.577

Ray Choudhuri, S. N., **On the growth of instability from precipitation.** *Indian Journal of Meteorology and Geophysics,* Delhi, 2(3):226–228, July **1951.** fig., 3 refs. **MH-BH**—The influence of the evaporation of rain on instability is examined. *Subject Headings:* **1. Instability 2. Precipitation 3. Evaporation.**—*A.A.*

4.3–124 551.515(99)

Rubin, Morton J.; Lamb, Hubert Horace, **South Polar atmospheric circulation.** *Meteorological Magazine,* London, 81(963):282–284, Sept. **1952. DWB**—Rubin criticizes Lamb's explanation (*see item* 3.6–87, June 1952, *MAB*) of the South Polar circulation, considering that well developed surface cyclones are improbable over the ice cap. Lamb justifies his arguments. *Subject Headings:* **1. Synoptic analysis 2. Antarctica.**—*C.E.P.B.*

4.3–125 551.515:525.63

Tomczak, Gerhard, **Der Einfluss der Küstengestalt und des vorgelagerten Meeresbodens auf den windbedingten Anstau des Wassers, betrachtet am Beispiel der Westküste Schleswig-Holsteins.** [The influence of the shape of the coast and of tidal flats on the piling up of

water by the wind, as shown on the coast of Schleswig-Holstein.] *Deutsche Hydrographische Zeitschrift*, Hamburg, 5(2/3):114–131, 1952. 4 figs., 8 tables, 15 refs. German, English, French summaries p. 114–115. **DWB**—A method is described of forecasting the height of storm floods on the North Sea coasts, taking account of wind force and direction, and local peculiarities. The high tides of Nov. 24, 1938, are discussed and the errors of forecasts 1936–1941 summarized. Sea level wind roses are shown in a folding plate. *Subject Headings:* **1. Storm tides 2. North Sea coasts.**—*C.E.P.B.*

4.3–126 551.515.1

Hüttmann, Heinrich, **Kurze Schilderung der Wettervorgänge auf einer Winterreise von Narvik nach Glasgow.** [Short description of weather sequence on a winter voyage from Narvik to Glasgow.] *Wetterlotse*, 37:33–36, March **1952. DWB**—Report on two depressions experienced by "Monika Wiards" Jan. 11–12, 14–15, 1952. Comment by RODEWALD. *Subject Headings:* **1. Barometric depressions 2. North Atlantic Ocean. I. Rodewald, Martin.**—*C.E.P.B.*

4.3–127 551.515.1(68)

§Vowinckel, E., **Marion storm-cyclone of November 1951.** *South Africa. Weather Bureau, Notos*, 1(1):4–6, **1952.** 3 figs. **DWB**—Brief synoptic study of a cyclone with record low pressures. An extensive central low was located in unusually low latitudes south of South Africa. *Subject Headings:* **1. Cyclones 2. Marion-Heard Region 3. South Indian Ocean.**—*A.A.*

4.3–128 551.515.11(262)

Bossolasco, Mario, **Sullo spostamento dei cicloni nel Mediterraneo.** [The weakening of cyclones in the Mediterranean.] *Geofisica Pura e Applicata*, 22(3/4):255–261, April/June **1952.** 2 figs., table, 3 refs. **MH-BH**—Two examples or retrograde displacement of depressions in the Mediterranean are being examined, explaining their causes. For one of them the energetic elements are calculated showing how the ratio K/P between the kinetic and the potential energy of the depression constitutes an index of its capacity to continue the motion along the preceding course. *Subject Headings:* **1. Cyclone dynamics 2. Cyclone weakening 3. Mediterranean Sea.**—*Author's abstract.*

4.3–129 551.515.11

§Regula, Walter, **Advektive und nichtadvective Vorgänge im Bereich einer Zyklone als Funktion von Raum und Zeit.** [Advective and non-advective processes in the region of a cyclone as a function of space and time.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:36–41, **1952.** 15 figs., 2 tables, 9 refs. **DWB**—In a detailed examination of surface pressure and thickness pattern 500–1000 mb over Europe, March 1–3, 1952, it is found that the adiabatic advective processes and ageostrophic advection are both locally large, but partly compensate for each other (correlation −0.63). Nonadiabatic thermal changes increase in importance with the age of the depression. *Subject Heading:* **1. Cyclone dynamics.**—*C.E.P.B.*

4.3–130 551.515.12/3:551.577.37

§Carr, J. A. (*U. S. Weather Bureau, Wash., D. C.*), **A winter storm at Los Angeles, California.** *Monthly Weather Review*, 80(1):10–13, Jan. **1952.** 7 figs., 4 refs. **DWB**—The case history of a storm (Jan. 12–18, 1952) which moved down from Alaska to California and turned inland between Los Angeles and San Diego is given. The outstanding feature of the storm was the exceptionally high amount of rainfall connected with it. The precipitation recorded during the storm was mainly responsible for the rainfall amount of 10.03 in. for the month, highest since the record 13.30 in 1916, and representing a considerable percentage of the annual mean which is slightly above 15 in. Surface, 500 mb and 200 mb pressure and air flow charts (with the jet stream indicated on a 200 mb chart) are presented and discussed. Damage and casualties are indicated. *Subject Headings:* **1. Storm rainfall 2. Excessive rainfall 3. Upper air pressure 4. Jet stream 5. Los Angeles, Calif.**—*G.T.*

4.3–131 551.515.13

Habermehl, R. and Faust, Heinrich, **Achsenneigung und Bewegungsrichtung von Tiefdruckgebieten.** [Axis inclination and direction of motion of depressions.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:123–126, **1952.** fig., tables, 9 refs. **DWB**—In depressions with a cyclonic steering about an upper low and the axis inclined only about 3° from horizontal, the axis becomes more vertical by about 1.6° per day and the surface depression moves cyclonically about the upper low by about 30° per day. *Subject Heading:* **1. Steering.**—*C.E.P.B.*

4.3–132 551.515.13:551.543.3

Hesse, Walter, **Symmetrien im Jahresgang der Steuerung.** [Symmetry in the annual variation of steering.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:85–86, **1952.** 3 figs., table, 5 refs. **DWB**—Author tabulates and illustrates a number of symmetry points of different types of steering in surface pressure and in tropopause observed in 1935–44. *Subject Headings:* **1. Symmetry points 2. Steering.**—*C.E.P.B.*

4.3–133 551.515.13(261)

Pollak, Leo Wenzel and O'Brien, Nuala, **Frequency of closed low pressure systems over the North Atlantic Ocean.** *Dublin Institute for Advanced Studies, School of Cosmic Physics. Geophysical Bulletin*, No. 3, April **1951.** 45 p. tables, graph, ref. **DWB**—Tables of the frequency of the centers of closed low pressure systems and the centers of closed low frequency stresses over the North Atlantic Ocean with pressures and centers 990 mb for the period 1899–1938 are given. The frequencies refer to the North Atlantic Ocean and its adjacent coasts between the equator and 70°N and between 90°W of Greenwich and the Greenwich meridian. *Subject Headings:* **1. Extratropical cyclone frequencies 2. North Atlantic Ocean.**—*I.L.D.*

4.3–134 551.515.13(234.3)

Zistler, Peregrin, **Alpenüberquerende Depressionen.** [Depressions crossing the Alps.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:95–101, **1952.** 2 figs., 16 refs. **DWB**—Six examples of depressions crossing the Alps from S to N are described. They originated in the Mediterranean, mostly near Tunis, hot Sahara air playing an important part. They are steered by a high level trough over W. Europe. *Subject Headings:* **1. Cyclone tracks 2. Alps.**—*C.E.P.B.*

4.3–135 551.515.8:551.515.11

§Kruhl, Heinrich, **Über Warmfrontwellen und zur Dynamik warmer Hochdruckgebiete.** [On warm front waves and the dynamics of warm anticyclones.] *Annalen der Meteorologie*, 5(1/2):15–29, **1952.** 12 figs., table, 6 refs., 5 eqs. German and English summaries p. 15. **DWB**—After an outbreak of cold air over W. Atlantic on Oct. 3, 1950, a depression in 50°N 30°W deepened from 990-970 mb and moved slowly NE on Oct. 3–5. A high strengthened and moved from Spain to Germany. On night of 3–4 a wave on the warm front S of Lerwick moved E. A 3-dimensional study shows the development of this wave, illustrated by temperatures, pressure levels and air trajectories. A theory of movement of rotating precipitating depressions is set out, by which pressure changes at various levels can be calculated. This is applied to the developments on Oct. 3–5. These were characteristic and lead to a schematic presentation of the development of a warm front wave. *Subject Headings:* **1. Atmospheric disturbances 2. Frontal waves.**—*C.E.P.B.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Actinometric bulletin, Japan,** 4.3–44; **Practice of infrared spectroscopy** (Lord and Foil), 4.3–48; **Sunlight and ammonia effects on AgI particles as sublimation nuclei** (Reynolds, Hume and McWhirter), 4.3–193.

4.3–136 551.521.3

Dirmhirn, Inge, **Die Himmelsstrahlung an der Biologischen Station Lunz.** [The sky radiation at the Lunz Biological Station.] *Wetter und Leben, Sonderheft,* No. 1:25–34, May **1952.** fig., 9 tables, 7 refs. **MH-BH**—In mountainous regions the effect of elevations above sea level upon sky radiation is influenced by orography, in particular the reflected radiation from slopes and exclusion of sky radiation by the absence of free horizon. The distribution of sky radiation from a cloudless and cloudy sky and the influence of the horizon, reflection from slopes and kind of surface was investigated. The sky radiation received by hemispherical surface and upon a horizontal surface perpendicular to the angle of incidence was measured. The daily variations of sky radiation are analyzed. *Subject Headings:* **1. Sky radiation 2. Orographic influences 3. Lunz Biological Station, Austria.**—*I.L.D.*

4.3–137 551.521.63:551.508.25

*Coblentz, W. W. (*Wash., D. C.*), **Summary of correlations of bioclimatic ultraviolet and total solar radiation in Washington, D. C., 1941–1950.** *American Meteorological Society, Bulletin,* 33(4):158–162, April **1952.** 3 tables, 10 refs. **MH-BH**—The mechanical problems encountered in the construction of a standard UV dosage-intensity meter and the method of standardization of the Zr-phototubes and their calibration are discussed. The results of a ten-year series of continuous daily measurements of the biologically effective component (wave lengths 2900Å to 3150Å) of ultraviolet solar and sky radiation incident on a horizontal plane are presented. The summarized data are in the form of monthly totals of biologically effective UV component of solar and sky radiation and monthly totals of all radiation of all wave lengths for each year. The ten year averages were found not to differ markedly from earlier 6 and 8 year averages. *Subject Headings:* **1. Ultraviolet measurements 2. Dosimeters 3. Washington, D. C.**—*I.L.D.*

4.3–138 551.521.63:551.586:634

de Villiers, G. D. B. (*S. Africa, West. Prov. Fruit Res. Sta., Stellen*), **Ultraviolet radiation as a cause of injury to peach twigs and its measurement by means of a cadmium photo-electric cell.** *South Africa. Dept. of Agriculture, Fruit Research, Technical Ser.,* No. 5, **1946.** 14 p. 4 figs., 5 tables, 8 refs. In English, summary in Afrikaans p. 13–14. **DWB**—Experiments to establish the cause of injury were carried out. Data on UV intensity are given. It was found that a special type of winter injury to peach twigs was induced by intense ultraviolet radiation, between 3200 and 2900 Å, a rich component of diffuse light. *Subject Headings:* **1. Ultraviolet radiation measurement 2. Fruit culture 3. Ultraviolet effects 4. Photoelectric cells 5. Stellenbosch, South Africa.**—*A.A.*

4.3–139 551.521.63:535.33

Douglas, A. E., **The near ultraviolet bands of N_2^+ and the dissociation energies of the N_2^+ and N_2 molecules.** *Canadian Journal of Physics,* 30(4):303–313, July **1952.** 4 figs., 3 tables, 12 refs. **DWB**—The ultraviolet emission bands of N_2^+ have been photographed using a six meter grating, and a number of new bands of high vibrational quantum number have been found. It has been possible to show that the $B^2\Sigma_u^+$ state dissociates at a limit 70,358 cm^{-1} above the ground state. It is shown that these results give strong support to the value 9.75 electron volts for the dissociation energy of nitrogen, but the lower value of 7.37 electron volts cannot be eliminated with certainty. The peculiar manner in which the $B^2\Sigma$ state converges to its dissociation limit is interpreted as being caused by an interaction between the $B^2\Sigma_u^+$ and the $C^2\Sigma_u^+$ states. *Subject Headings:* **1. Ultraviolet spectrum 2. Nitrogen bands.**—*Author's abstract.*

4.3–140 551.521.63:551.586

Ellerbroek, U., **Sonneneinwirkung und Lichtschutzmittel.** [Solar effect and means of light protection.] *Annalen der Meteorologie, Medizin-meteorologische Hefte*, No. 7:13–17, **1952.** 8 refs. **DWB**—UV radiation is divided into: *a*, above 315 mμ, causing direct skin pigmentation; *b*, 315–280 and *c*, below 280 mμ, causing erythema followed by pigmentation. In solar radiation *a*, *b*, *c* occur in ratio 1500:1:0, in mercury vapor lamp 1:1:1. Discussion includes natural protection (e.g., by fat), skin diseases due to light, and use of cosmetics as UV filters. *Subject Headings:* **1. Ultraviolet radiation 2. Skin functioning.**—*C.E.P.B.*

4.3–141 551.521.63:551.510.536

Gauzit, Junior, **Formules pratiques exprimant l'intensité et le nombre de photons du rayonnement solaire ultraviolet atteignant la haute atmosphère terrestre.** [Practical formulae representing the intensity and the number of photons in the ultraviolet solar radiation reaching the upper atmosphere of the earth.] *Annales de Géophysique*, Paris, 7(4):254–255, **1951. MH-BH**—Author presents three equations which he believes to be more useful in computing the energy per cm² received by a surface, normal to solar rays, at the limit of the atmosphere and the corresponding number of photons, than the tables generally used in such computations. An example of the application of the equations is given. *Subject Headings:* **1. Ultraviolet radiation 2. Radiation calculations 3. Extraterrestrial radiation.**—*G.T.*

4.3–142 551.521.63:535.33

Herzberg, G., **Forbidden transitions in diatomic molecules. II.** *Canadian Journal of Physics*, 30(3):185–210, May **1952.** 8 figs., 8 tables, 25 refs. **DWB**—The forbidden ${}^3\Sigma_v^+ - {}^3\Sigma_g^-$ absorption bands of O_2 in the near ultraviolet have been obtained under high resolution with absorbing paths up to 800 m. A detailed fine structure analysis has been carried out. It confirms the identification of the band system as a ${}^3\Sigma_v^- - {}^3\Sigma_g^-$ transition. Precise values of the rotational constants B_v and D_v as well as of the vibrational quanta $\Delta Gv+\frac{1}{2}$ in the upper state have been derived. Each of the "lines" of the Q branches observed under low dispersion is resolved into six components whose spacing yields the triplet splitting in the upper state. This splitting is more than twice as large as in the ${}^3\Sigma_g^-$ ground state and is of opposite sign. The splitting constants λ and γ have been determined and their variation with the vibrational quantum number observed. In addition to the Q-form branches, weak O- and S-form branches have been found in agreement with the prediction of Present, which is based on the assumption that spinorbit coupling is the main cause for the occurrence of this forbidden transition. However, the relative intensities of the different branches deviate strongly from Present's prediction. The dissociation limit obtained from the convergence limit of the bands (without extrapolation) is at 41219 ± 40 cm^{-1}. This value is higher by about 220 cm^{-1} than the value of the dissociation energy of O_2 derived from the Schumann-Runge bands. It is possible that the limit of the Schumann-Runge bands, which is based on a short extrapolation, and therefore the value of the dissociation energy of O_2 has to be slightly revised. The electron configurations and dissociation products of the various electronic states of O_2 are briefly discussed. *Subject Headings:* **1. Absorption bands 2. Ultraviolet radiation.**—*Author's abstract.*

4.3–143 551.521.63:523.75

Miyamoto, Shotaro (*Inst. of Astrophysics, Kyoto Univ.*), **On the ultraviolet emission of the chromosphere.** *Astronomical Society of Japan, Tokyo, Publications*, 2(3):102–112, **1951.** eqs. **DLC**—This paper contains a theoretical treatment of Lyman alpha radiation and ultraviolet radiation. The latter is conceived as the result of a chain of transition through three different stages by excitation, photoelectric ionization and recombination. In a numerical computation the author obtains values of ultraviolet and Lyman alpha radiation intensity, of the ratio of ions to neutral atoms and of the optical thickness of the chromosphere, both for the recently suggested and widely adopted chromospheric electron temperature of 35,000 and for the assumed electron temperature of 20,000. *Subject Headings:* **1. Chromosphere 2. Ultraviolet radiation.**—*G.T.*

4.3–144 551.521.63:551.521.3

Sekihara, K., **Studies of the distribution of the ultraviolet sky radiation (II), on the role f the secondary scattering.** *Papers in Meteorology and Geophysics*, Tokyo, 2(2):158–167, une **1951.** 4 figs., 4 tables, 6 refs. **MH-BH**—The development of the theoretical formula f A. Hammond and S. Chapman for calculating the secondary scattering of solar radiation rom a clear sky is presented and this equation is corrected by the introduction of a correction or the effect of polarization caused by primary scattering. A comparison of the calculated alues of scattered sunlight on the range of 0° to 45° of the zenith angle with observed values ndicates a good agreement. *Subject Headings:* **1. Ultraviolet radiation 2. Polarization.**—*L.D.*

4.3–145 551.521.63:535.34

Seya, Masao, **On the absorption spectrum Si, O, N, C in the extreme ultraviolet region.** *Tokyo. Univ. of Education, Institute for Optical Research, Science of Light*, 1(1):11–18, Jan. **951.** fig., 8 tables, refs. In Japanese, English summary in append. p. 1–2. **DWB**—During the study of the absorption spectrum of various kinds of gases, there appeared many bsorption lines on the Lyman continuum used as the light source. Most of them are due to i I, Si II, O I, N I and C I. Si-lines come out from Si-atoms produced by the heavy condensed discharge passing through the glass capillary tube. The other lines come out from he respective atom produced by the decomposition of gas used as an absorbing substance. The precise measurements of their wavelength and classifications were made and the results btained were compared with that of the previous works most of which were studied in the mission spectrum. Excepting the Si-lines most of the remaining lines observed appeared ery sharp, so that they will be used as the substandard lines in measuring the wavelength n the extreme ultraviolet region. *Subject Headings:* **1. Absorption spectra 2. Ultraviolet pectrum.**—*Author's abstract.*

4.3–146 551.521.63

Stair, Ralph, **Ultraviolet spectral distribution of radiant energy from the sun.** *U. S National Bureau of Standards, Journal of Research*, 46(5):353–357, May **1951.** 3 figs., 3 tables, 0 refs. **DLC**—This paper gives the results of some preliminary measurements on the ultraiolet spectral energy distribution of direct solar radiation at Washington, D. C. Data are iven for wavelengths extending below 300 millimicrons for air masses approximating $M = 1.4$. Tew equipment and method used permit the rapid acquirement of a prismatic ultraviolet pectral energy curve at sea level showing greater Fraunhofer structure than previously obained even at desert and mountain stations. Other applications of this equipment, for xample, in the study of total ozone and in sky-light spectral-energy distributions are suggested. *ubject Headings:* **1. Ultraviolet radiation 2. Ultraviolet spectrum.**—*Author's abstract.*

4.3–147 551.521.63:551.508.25(581)

Stenz, Edward, **Kilka spostrzeżeń nad promieniowaniem nadfiolkowym w Afganistanie** S>me observations on ultraviolet radiation in Afghanistan.] *Przegląd Meteorologiczny Hydrologiczny*, 1950/1951:166–180, **1951.** 4 figs., 2 tables, 7 refs. English summary p. 179–80. **DWB**—Results of measurements of ultraviolet radiation (from the sun and sky) carried ut by the author at Kabul in 1940–1942 by means of an ultraviolet dosimeter constructed y the Experimental Laboratory of the I. G. Farbenindustrie Concern at Oppau, Germany are resented and discussed. It was found that the dosimeter is a sensitive and reliable instrument hich reacts to and registers even small variations of intensity of UV radiation. It was esablished that UV radiation depends in great measure on the sun's altitude, on conditions of he sky and transparency of the air. It is also a sensitive factor for the study of optic propties of the earth's atmosphere. *Subject Headings:* **1. Ultraviolet radiation measurement . Ultraviolet dosimeters 3. Afghanistan.**—*A.M.P.*

AIR TEMPERATURE

See also: **Studies of typhoon and convection** (Fujita), 4.3–4; **Low-level temp. sounding system** (Myers), 4.3–55; **Thermal structure of stratosphere; tropics,** (Koteswaram), 4.3–96; **Effects of temp. variations of upper atmos. on formation of ionospheric layers** (Lepechinsky), 4.3 102; **Relation between potential-equivalent temp. and pseudo-potential temp.** (Demiańczuk), 4.3–108; **Heat diffusion from plane** (James), 4.3–109; **Heat transport and zonal stress between latitudes** (Priestly), 4.3–118; **Effect of protracted spring thaws on ice, Hudson Bay** (Mackay), 4.3–161; **Temp. measurements near water surface** (Roll), 4.3–162; **Relation of low level humidity over sea to wind force, temp. difference air-sea** (Gordon), 4.3–190; **Microclimatology. Temp. inversions, Cournon Hill, France** (Benac and Lafargue), 4.3–260; **Bibliography on frost,** p. 337–397.

4.3–148 551.524.32:551.581:551.588.

†Lautensach, Hermann, **Die Isanomalenkarte der Jahresschwankung der Lufttemperatu Ein Beitrag zur allgemeinen analytischen Formenwandellehre.** [The isanomaly chart of th annual temperature variation. A contribution to the general analytical study of form change. *Petermanns Geographische Mitteilungen*, 96(3):145–155, **1952.** 2 charts, tables, 52 refs. **DW** —The various factors in the range between mean January and July temperatures, and th various continentality formulas, are discussed. The latitude effect is eliminated by takin differences from latitude means; revised values of the latter are given and related to annua variation of incoming radiation. A large world chart of anomalies by author and O. H. Rose is reproduced and fully discussed in relation to climatic types. Finally, the range is analyze into four components: planetary, height above sea, peripheral-central (of continents an islands) and west-east. *Subject Headings:* **1. Seasonal temperature variations 2. Solar climat 3. Continentality.**—*C.E.P.B.*

4.3–149 551.524.3

Manley, Gordon, **A warm decade.** *Weather*, 7(8):242–243, Aug. **1952.** table. **DWB**— Table of mean monthly temperature for Lancashire, England, 1946–50. The decade 1941–5 was warmer than average during March through Nov. *Subject Headings:* **1. Temperatur trends 2. Lancashire, England.**—*C.E.P.B.*

4.3–150 551.524.35:551.543.2(439.1

Berkes, Zoltán, **Néhány szingularitás szinoptikus vizsgálata.** [Synoptic investigation of certain singularities.] *Időjárás*, 54(7/8):199–203, July/Aug. **1950.** 2 figs., 3 refs. **MH-BI** —Singularities of Feb. 2, June 8 and Oct. 3 are investigated. Mean pentad and decada values of pressure and temperature over Europe are presented for the years 1946–1949 an claimed to prove a regular recurrence of the singularities. Data are found to harmonize wit mean values over a period of 75 years. The occurrence of the singularities is traced back t advective changes in air masses. The solar constant and variations in lunar radiation ar mentioned as possible original causes, as yet beyond the reach of exhaustive analysis. *Subje Headings:* **1. Singularities 2. Long period records 3. Temperature anomalies 4. Pressur anomalies 5. Cosmic influences 6. Hungary.**—*G.T.*

4.3–151 551.524.3

Dué Rojo, Antonio and Gimeno Riutort, Antonio, **El régimen de heladas en el Observa torie de Cartuja, Granada.** [Frost regime at the Cartuja Observatory at Granada.] *Revist de Geofísica*, Madrid, 10(40):292–302, Oct./Dec. **1951.** 4 tables. *Granada. Observatorio d Cartuja, Trabajos Cientificos Ser. B*, 5(40), **1951. DWB**—Length of non-growing season (fro first of autumn to last spring killing frost) each winter from 1902 to 1950 (48 seasons) fro Granada, Spain is shown graphically. Number of days duration varies from 7 (1907–8) to 14 whereas actual number of frost days each season varies from 2 to 63 (1906–7). Conrad' methods are used to analyze data statistically, with resulting histograms and curves showin type of distribution and class intervals for degrees of severity of winters according to (1) firs frost, (2) last frost, (3) duration of frost period and (4) frequency of frost. All the distribu tions are skewed greatly toward later dates for (1) and (2), toward shorter duration or betwee days for (3) and (4). *Subject Headings:* **1. Frost frequencies 2. Frost duration 3. Statistica studies 4. Cartuja Observatory, Granada, Spain.**—*M.R.*

4.3–152 551.524.4:551.571.4:551.553.11

Pedlow, R. H., **Vertical variation in temperature and humidity with on-shore and off-shore winds near the coast of south-east England.** *Meteorological Magazine*, London, 81(964): 99–302, Oct. **1952.** 4 tables, ref. **DWB**—Hourly values of temperature and vapor density 1 miles inland at Rye, Sussex, at heights 1.1, 15.2, 47.2 and 106.7 m and differences are tabulated or on-shore and off-shore winds in summer. On-shore winds show higher vapor density, teeper vapor lapse rate, higher temperature by day and steeper temperature lapse. The auses are (a) sea breezes on hot days; (b) on-shore winds are part of a southerly air stream. Occasions of sudden wind change are also examined. *Subject Headings:* **1. Land and sea reezes 2. Vertical temperature gradient 3. Humidity lapse rate.**—*C.E.P.B.*

4.3–153 551.524.4(52)

Umetani, H., **On the vertical distribution of temperature near the ground in the season f the first frost.** *Japan. Central Meteorological Observatory, Tokyo, Memoir of Industrial Meteorology*, 15(1):60–66, May **1951.** 4 figs., 2 tables. English summary p. 66. **DWB**—Results of observations made during 45 nights are discussed. The vertical temperature istribution depends on the weather conditions; during weak winds an inversion is observed. The relation between the degrees of temperature inversion (y) and wind speed (x) can be xpressed by the exponential formula $y = ae^{-bx}$, where a and b are constants. *Subject Headings:* **. Temperature profiles 2. Temperature inversions 3. Frost 4. Japan.**—*A.A.*

4.3–154 551.524.7:539.1

Duperier, A., **On the positive temperature effect of the upper atmosphere and the process f meson production.** *Journal of Atmospheric and Terrestrial Physics*, 1(5/6):296–310, **1951.** figs., 9 tables, 7 refs., 8 eqs. **DWB**—A positive correlation is found between the temperature f the 50–200 mb layer and the sea level meson intensity which appears to be uninfluenced by ower layers. An explanation of this relationship is given. *Subject Headings:* **1. Upper air emperatures 2. Meson intensity.**—*A.A.*

4.3–155 551.524.7:551.557

Miles, M. K., **Temperature and wind distribution in the lower stratosphere.** *Meteorological Magazine*, London, 81(961):212–215, July **1952.** **DWB**—General account of the layer etween 200 and 100 mb near the British Isles. The thermal structures are related to surface eatures and tropopause structure, and vertical motion estimated. Winds at 100 mb are very teady in spite of large changes at tropopause; wind shear 200–100 mb is examined. *Subject Headings:* **1. Upper air temperatures 2. Winds in stratosphere.**—*C.E.P.B.*

4.3–156 551.524.7

Warzecha, L. W., **Atmospheric temperature variation with altitude.** *General Electric Co., Engineering Div. Project Hermes, Report*, No. R51A0522, July **1951.** 45 p. 41 figs., 5 refs. **DLC**—The average vertical temperature distributions for Jan., July and the year are presented o the height of 16 km for twelve places in North America. The 99% limits are shown. The ata cover a five year period. The author thinks that the NACA temperature ranges are xtremely conservative, e.g., at 50,000 ft extreme low temperature at San Juan, P. R. (prob. /20,000) is—128°F (NACA—136°F) and warmest at Anchorage—25°F (NACA—11°F). *Subject Headings:* **1. Temperature profiles 2. Vertical temperature gradient 3. NACA standard atmosphere 4. Temperature extremes 5. North America.**—*A.A.*

SOIL TEMPERATURES

4.3–157 551.525.5:581.036.5

Bethlahmy, Nedavia (*U. S. Dept. of Agri., Upper Darby, Penna.*), **Why do plants wilt in cold weather?** *Ecology*, Brooklyn, N. Y., 33(2):301–303, April **1952.** fig., 2 refs. **MH-BH**—Observations at the northern forest experimental station at Upper Darby, Pa. made by means f the Colman soil moisture unit indicated that ground freezing is at least as important as rotoplasm injury in causing the death of plants. The investigation showed that a frozen oil is, physiologically, a dry soil. The plants growing in frozen soil have no moisture available

for growth and they will wilt. Under investigation are other factors important for plant growth such as the depth of the frost line, the depth of the soil, the rooting habits of the plant and the depth of the snow cover. In the case of the snow cover, if the depth is enough to cover the plant and thereby prevent transpiration while the soil is frozen, the plant will not wilt. *Subject Headings:* **1. Frozen soil 2. Soil freezing effects 3. Soil moisture 4. Plant ecology 5. Snow cover effects.**—*A.M.P.*

4.3–158 551.525.5:01(

†Johnson, A. W. (*Nat. Res. Council, Highway Res. Bd.*), **Frost action in roads and airfields a review of the literature, 1765–1951.** *National Research Council, Wash., D. C., Highway Research Board, Special Report,* No. 1, **1952.** 287 p. 242 figs., 79 tables, bibliog. p. 253–281 **DWB**—On the basis of an added bibliography of works published in English and foreign languages with over 800 items covering the years 1765–1951 the author gives a comprehensive review of literature with ample useful tables and figures. The work contains also much information of interest for meteorologists and hydrologists about the physical processes of soil freezing and thawing, soil properties, penetration of frost and permafrost. Climatic charts for United States are included for frost penetration, the data of the first and last killing frost the areas where ground is subject to freezing, and the freezing index. *Subject Headings:* **1. Soil freezing 2. Soil thawing 3. Permafrost 4. Soil climates 5. Soil freezing bibliographies.**—*A.A.*

4.3–159 551.525.5:536.2(47

Kolesnikov, A. G., **K izmeneniiu matematicheskoĭ formulirovki zadachi o promerzanii grunta.** [A modification of the mathematical formulation of the problem of soil freezing.] *Akademiia Nauk SSSR, Doklady,* 82(6):889–891, Feb. 21, **1952.** 3 refs., 9 eqs. **MH-BH**—At present, many investigations make the mistake of assuming that during soil freezing the water contained in the soil is transformed into ice. However, this is correct only for water in the free state, but combined water freezes later with significant decrease of soil temperature to below the freezing point. The increase of ice amount in the soil causes a decrease of specific heat of the soil and an increase of thermal conductivity of the soil. The author takes into consideration these peculiarities in the equations presented here. *Subject Headings:* **1. Soil freezing 2. Thermal conductivity 3. Soil temperatures 4. U.S.S.R.**—*N.T.Z.*

4.3–160 551.525.5

Thomson, Andrew and Bremner, P. C., **Permafrost drilling and soil-temperature measurements at Resolute, Cornwallis Island, Canada.** *Nature,* London, 170(4330):705–706, Oct 25, **1952. DWB**—In 74°41′N, 94°54′W deep holes were bored in frozen gravel and limestone and temperature obtained at 8, 18, 39 and 60 in. and 6, 11, 23, 30, 50, 98, 300 and 450 ft depths results briefly summarized. *Subject Headings:* **1. Permafrost 2. Resolute, Canada.**—*C.E.P.B*

LAKE AND SEA TEMPERATURES

See also: **Relation of low level atmospheric humidity over sea to wind force, temp. difference air-sea** (Gordon), 4.3–190; **Gulf Stream and our climate** (Groen), 4.3–279.

4.3–161 551.526.6:551.311.18:551.524.32(268)

Mackay, G. A. (*Canadian Met. Ser., Gander, Nfld.*), **The effect of protracted spring thaws on ice conditions in Hudson Bay.** *American Meteorological Society, Bulletin,* 33(3):101–106, March **1952.** 5 figs., 14 refs. **DLC**—Reconnaissance flights over Hudson Bay made in March and April showed virtually complete ice cover. In early May, however, large areas of open water were observed. An analysis of winter temperatures indicate lower than normal minimum and maximum temperatures for the period Jan. to April and a synoptic analysis of the weather situation in late April and early May revealed an easterly circulation of modified polar Atlantic air and above normal temperatures over the southern half of Hudson Bay. On the basis of a 21 year record of dates of ice clearance and mean monthly temperature at Churchill Harbour, there is established a good correlation between mean temperature of late

spring months and the dates of ice clearance. A similar correlation was established for Montreal Harbour. *Subject Headings:* **1. Ice cover duration 2. Spring thaws 3. Polar ice 4. Sea temperatures 5. Hudson Bay.**—*I.L.D.*

4.3–162 551.526.6:551.524.3

Roll, Hans Ulrich, **Temperaturmessungen nahe der Wasseroberfläche.** [Temperature measurements near the water surface.] *Deutsche Hydrographische Zeitschrift*, Hamburg, 5(2–3):141–143, **1952.** 2 figs., 3 refs. English, French summaries p. 143. **DWB**—Gives results of observations in summer 1950 from 50 cm above to 6 cm below surface of small tidal pools around Neuwerk Is. Discontinuities of 1–2°C were found at the surface on several afternoons. *Subject Headings:* **1. Air-sea temperature variations 2. Neuwerk Islands.**—*C.E.P.B.*

4.3–163 551.526.6:551.464

Sugiura, L., **On the water temperature and salinity in the Antarctic Ocean.** *Journal of Meteorological Research*, Tokyo, 2(12):357–362, Dec. **1950.** 17 tables. In Japanese, English summary p. (11). **DWB**—Variations in the water temperature and salinity in the Antarctic Ocean covering lat 63°S–76°S, long 145°E–179°W during the southern summers from Dec. 1946 to March 1949 were analyzed. The change in water temperature ranged between +2.8°C and −1.9°C and salinity between 34.85 and 32.36‰. Data on diurnal and seasonal temperature changes and on behavior near ice pack are given. *Subject Headings:* **1. Sea temperatures 2. Salinity 3. Oceanography 4. Antarctic Ocean.**—*I.L.D.*

4.3–164 551.526.8:532.594

Mortimer, C. H., **Water movements in lakes during summer stratification; evidence from the distribution of temperature in Windermere.** *Royal Society of London, Philosophical Transactions, Ser. B*, 236(635):355–404, May 6, **1952.** 22 figs., 2 tables, 44 eqs., 60 refs. **DWB**—Author investigated oscillations of the boundary between two layers of different temperature in Lake Windermere (temperature seiches) during calm following wind, using a thermoelectric thermometer. Numerous vertical temperature sections are given. Analysis shows that the sharp boundary is replaced by an intermediate layer; internal waves in a 3-layer basin are examined theoretically and compared with observations in a model and in Lake Windermere. *Subject Headings:* **1. Lake temperatures 2. Seiches 3. Lake Windermere, England.**—*C.E.P.B.*

4.3–165 551.526.8

Morton, Friedrich, **23 Jahre regelmässige Temperaturlotungen im Hallstättersee.** [25 years of regular temperature soundings in Hallstätter Lake.] *Austria. Zentralanstalt für Meteorologie und Geodynamik, Jahrbuch*, Abhang 4:D23–39, **1950.** tables. **DWB**—Gives daily results of soundings from Oct. 1927 to Dec. 1950, by boat at surface and to a depth of 100 m in middle of lake. *Subject Headings:* **1. Lake temperatures 2. Hallstätter Lake, Austria.**—*C.E.P.B.*

ATMOSPHERIC PRESSURE AND WIND

PRESSURE

See also: **Studies of typhoon and convection** (Fujita), 4.3–4; **Calculation of air layer between 2 standard pressure levels from tephigram** (Casswell), 4.3–33; **S. Hemisphere sea level pressure,** 4.3–74; **New formula for change of relative topography by advection** (Dahler), 4.3–77; **Prognostic value of barotropic models in forecasting 500 mb height changes,** 4.3–80; **Isopycnic level, coupling of tropopause and surface waves** (Doporto), 4.3–85; **Mean pressure and air streams in troposphere, summer, winter** (Flohn), 4.3–95; **Symmetry in annual variation of steering** (Hesse), 4.3–132; **Synoptic investigation of certain singularities** (Berkes), 4.3–150; **Gradient wind parabola** (Väisälä), 4.3–186; **Diurnal wind velocity and pressure variation, upper atmos.** (Arakawa), 4.3–188.

4.3–166 551.541:551.558.21:551.501.7

Colson, DeVer (*U. S. Weather Bur., Wash., D. A.*), **Results of double-theodolite observations at Bishop, Cal., in connection with the "Bishop-Wave" phenomena.** *American Meteorological Society, Bulletin*, 33(3):107–116, March **1952.** 14 figs. table, 9 refs. **MH-BH**—The

standing wave patterns in the flow over and to the lee of mountain crests produced when air is forced over mountain ridges are manifested in lenticular cloud patterns with proper moisture distribution and atmospheric stability and are known as "Bishop" or "Sierra Wave" in the Owens Valley in California. The use of double theodolite pilot balloons to study the actual air currents in this area is described and the results of observations for the period Feb.-May 1951 are discussed. "Comparisons between single and double computations are shown. The mean actual ascension rates are compared for each month and the mean ascension rates for the entire period are compared with the standard assumed single-theodolite ascension rates. Relations between the mean annual ascension rates and the local topography, the elevation of the balloon, the direction and speed of the general upper level wind are shown." Examples of standing waves obtained by glider and double-theodolite data giving wave lengths of about 20 km are presented. Photographs of wave clouds and of a panoramic view of the Owens Valley are included. *Subject Headings:* **1. Lee waves 2. Bishop waves 3. Balloon ascension rates 4. Double theodolite observation 5. Bishop, Calif.**—*I.L.D.*

4.3–167 551.543.3

Mildner, Paul, **Zum Problem der Symmetriepunkte.** [On the problem of the symmetry points.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:81–84, **1952.** 3 figs., 11 refs. **DWB**—Pt. 1 discusses the reality of symmetry points. Though they may arise by chance, a connection with variation of the general circulation and with steering can be demonstrated, so they are probably real results of rhythms in circulation processes which may govern the general weather over long periods. In Pt. 2 examples of synoptic phenomena associated with good symmetry points are illustrated. *Subject Heading:* **1. Symmetry points.**—*C.E.P.B.*

4.3–168 551.543.3

Robitzsch, Max, **Kippvorgänge.** [Jump processes.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:90–91, **1952. DWB**—"Jump processes," due to sudden release of potential energy, frequently occur in the atmosphere due to neighborhood of air masses of different temperature. *Subject Heading:* **1. Pressure jumps.**—*C.E.P.B.*

4.3–169 551.543.3(09)

†Schlegel, Max, **30 Jahre Symmetriepunktforschung.** [Thirty-year symmetry point investigation.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:87–90, **1952.** 69 refs. **DWB**—First to mention symmetry was W. R. Birt (1846). The history of the investigation of symmetry since Weickmann (1923) is summarized, including symmetry in weather charts. *Subject Headings:* **1. Symmetry points 2. History of meteorology.**—*C.E.P.B.*

4.3–170 551.543.3

Schwerdtfeger, Werner, **Über die Enstehung mehrtägiger Rhythmen im Wetterablauf.** [On the development of many-day rhythms in the course of weather.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:16–20, **1952.** fig., table, 17 refs. German and English summaries p. 16–17. **DWB**—Quasi-periodic pulsations in the lower troposphere, originating in cold air invasions, are disturbed by other processes such as high-level pressure waves, so that only temporary rhythms can develop. This is illustrated by the 6–7 day pulsation of the thermal low in NW Argentina. *Subject Headings:* **1. Pressure waves 2. Argentina.**—*C.E.P.B.*

4.3–171 551.543.5:551.547.3

de Bary, E. and Möller, Fritz, **Die Druckänderungen im 500- und 1000-mb-Niveau in 6-, 12- und 24-stündigen Intervallen.** [Pressure changes at the 500 and 1000 mb level in 6-, 12- and 24-hour intervals.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:20–26, **1952.** 4 figs., 7 tables, 6 refs. **DWB**—Following work by H. Hoinkes, author uses 6 hourly radiosondes at Berlin to correlate changes of 1000 and 500 mb levels and variations of mean temperature of the intervening layer. Highest correlations (+0.9) are found between 1000 mb and temperature changes. Relations between 1000 and 500 mb levels are related to preceding changes of these levels. *Subject Heading:* **1. Baric topography.**—*C.E.P.B*

4.3–172 551.547:551.513

Schmitt, W., **Preliminary mean absolute topography 500 mb Southern Hemisphere 70°W to 120° summer 1951/52.** *South Africa. Weather Bureau, Notos,* 1(1):7–17, 1952. 6 figs., 3 tables, 4 refs. **DWB**—Only a few upper air observations were available to the author, who drew daily maps of the relative topography based mainly on the distribution of the principal air masses and fronts on the daily surface maps. The mean absolute topography is given for Dec. 1951, Jan. 1952 and Feb. 1952 and for the whole summer season. A permanent anticyclone was observed over South Africa and low troughs on the east side of South Africa and South America. *Subject Headings:* **1. Absolute topography 2. Southern Hemisphere.**—*A.A.*

WIND

See also: **Microclimate factors in smoke pollution** (Lowry), 4.3–93; **Scintillation of radio stars during aurorae and magnetic storms** (Little and Maxwell), 4.3–103; **Weather in upper troposphere** (Prandtl), 4.3–119; **Jet stream, Japan** (Serebreny), 4.3–120; **Vertical temp. and humidity variation with on- and offshore winds, SE England** (Pedlow), 4.3–152; **Double theodolite observations of "Bishop Wave"** (Colson), 4.3–166; **Relation of low level atmos. humidity over sea to wind force, temp. difference air-sea** (Gordon), 4.3–190; **Cloud over Etna in eruption** (Affronti), 4.3–206.

4.3–173 551.553.4

Hommel, Karlheinz, **Die Säkulare Schwankung der Windrichtung auf dem Hohenpeissenberg.** [The secular variation of wind direction on the Hohenpeissenberg.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 38:396–400, 1952. 2 figs., 5 tables, 8 refs. **DWB**—From 1879–1951 the winds have varied in direction, being more westerly about 1900, 1925 and 1950 and more SWly about 1880, 1917 and 1938. Associated changes of temperature and precipitation are tabulated. *Subject Headings:* **1. Wind variations 2. Hohenpeissenberg, Germany.**—*C.E.P.B.*

4.3–174 551.553.6

Jenkinson, A. F., **Frequency of spells of light wind.** *Meteorological Magazine,* London, 81(964):305–307, Oct. 1952. fig., 2 tables. **DWB**—Numbers of spells f' of force 0–3 at all observations in N days, lasting x or more days at Brindisi and Malta, are tabulated. Frequencies are fitted by logarithmic curve $f' = Nf^{x+l} \log (1/f)$, where f is average frequency of light winds. *Subject Heading:* **1. Wind frequencies.**—*C.E.P.B.*

4.3–175 551.553.6

*Pfau, Rolf, **Die Bodenwindverhältnisse an der Bergwetterwarte Stötten (Schwäbische Alb).** [Surface wind conditions at the mountain observatory of Stötten.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 38:213–227, 1952. 8 figs., 9 tables, 8 refs. **DWB**—Wind records for 1947–51 at Stötten, 734 m high in 47°44′N, 10°42′E, are analyzed in great detail and compared with Hochrhön and Wasserkuppe. Diagrams and tables give diurnal and annual variation of direction and speed, frequency of different speeds, etc. *Subject Headings:* **1. Wind frequencies 2. Stötten, Germany.**—*C.E.P.B.*

4.3–176 551.555.1

Jordan, Charles L.; Palmer, Clarence Edgar, **Equatorial westerlies in the western North Pacific.** *Journal of Meteorology,* 9(5):376–378, Oct. 1952. table, 5 refs. **MH-BH**—Jordan contests Palmer's statement in "Compendium of meteorology" that equatorial westerlies are due to passage of cyclonic vortices N and S of equator. Palmer replies. *Subject Headings:* **1. Equatorial westerlies 2. Western North Pacific.**—*C.E.P.B.*

4.3–177 551.555.1(264)

Walden, Hans, **Die "Passat" im Passat.** [The "trade" in the trade.] *Wetterlotse,* 41:109–111, June 1952. **DWB**—Describes weather in 13–15°S, 32–33°W on March 11, 1952, in a weak secondary depression in the SE trade. *Subject Headings:* **1. Trade wind variations 2. South Atlantic Ocean.**—*C.E.P.B.*

4.3–178 551.555.3

Herzog, J., **Föhnvorstösse im Alpenvorland.** [Föhn advances in Alpine foothills.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:101–104, **1952.** 2 figs., 3 refs. **DWB**—Temperature, potential temperature and humidity in southern Bavaria resulting from 2 föhn outbreaks on Nov. 7–8, 1951, are examined, including upper air temperatures. *Subject Headings:* **1. Föhn winds 2. Bavaria, Germany.**—*C.E.P.B.*

4.3–179 551.555.3(79)

Ives, Ronald L., **Snow eaters of the high plains.** *Weatherwise*, 5(2):32–34, April **1952.** 3 figs. **MH-BH**—A brief discussion is presented of the physical processes underlying the formation of Chinook winds, the local conditions producing Chinooks and fall winds in Western Colorado, and of Washoe zephyrs in the California Sierras. The behavior and effect of Chinooks and their temperature, humidity and pressure characteristics are described, and the problem of Chinook prediction is considered. A schematic diagram illustrating the sequence of meteorological phenomena during the development and passage of a Chinook wind, photographs of a Chinook crest and of a standing cloud are given. *Subject Headings:* **1. Chinook winds 2. Fallwinds 3. Washoe zephyrs 4. Chinook forecasting 5. Colorado.**—*I.L.D.*

4.3–180 551.555.3

Schweitzer, H., **Wie entsteht der Föhn?** [How does the föhn originate?] *Umschau*, Frankfurt a.M., 52(19):586–589, Oct. 1, **1952.** 3 figs., 2 photographs, 6 refs. **DLC**—A clear account of the peculiarities of the föhn in the Alps: descent of light air through heavier, development of turbulence and rotation, location and frequency. The phenomena are explained by analogy with the flow of water in a channel, introducing two layers and the development of turbulence at a "hydraulic jump." Illustrated by photographs showing the development of föhn in Owens Valley, California. *Subject Heading:* **1. Föhn theory.**—*C.E.P.B.*

4.3–181 551.555.3(794)

Sergius, Leo A. (*U. S. Weather Station, Los Angeles, Calif.*), **The Santa Ana.** *Weatherwise*, 5(3):66–68, June **1952.** 4 figs. **MH-BH**—The wind flow patterns of the Santa Ana are described with the aid of diagrams showing surface streamlines and isovels. The relationship of the föhn type wind to forest fires, the meteorological conditions associated with its origin and the problem of its forecasting are discussed. *Subject Headings:* **1. Santa Ana winds 2. Föhn winds 3. California.**—*I.L.D.*

4.3–182 551.555.3

*Ungeheuer, H., **Zur Statistik des Föhns im Voralpengebiet.** [On statistics of föhn in the Alpine foreland.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:117–120, **1952.** fig., 4 tables, 6 refs. **DWB**—Tables give monthly values of frequency and duration of föhn, relations to general type and diurnal variation of beginning and ending, at Bad Tölz 1939 through 1950. *Subject Headings:* **1. Föhn statistics 2. Bad Tölz, Germany.**—*C.E.P.B.*

4.3–183 551.555.6:551.576.11

Georgi, Johannes, **Der Drehsinn einer Pampero-Walze. Eine Berichtigung.** [The direction of rotation of a pampero whirl. A correction.] *Annalen der Meteorologie*, 5(1–2):59–60, **1952.** **DWB**—A discussion of the question whether there is a descending current in front of a whirl associated with a squall cloud. *Subject Headings:* **1. Pamperos 2. Cloud structure.** —*C.E.P.B.*

4.3–184 551.556:551.46:532.59:627.5(02)

Minikin, Robert C. Royal, **Winds, waves and maritime structures. Studies in harbour making and in the protection of coasts.** London, Charles Griffen, **1950.** 216 p. photos, diagrs., tables, charts. **DLC**—The text opens with a fairly technical chapter on wind and weather, followed by one on wave generation by wind, one on the theory of wave form, and then a number of chapters on the practical effects of waves on obstructions (breakwaters, foundations, sea walls, harbors, slipways, dredging operations, etc.). A useful table gives the approximate period, length, height and ratio of length to height, of waves generated by winds

of Beaufort Force 6, 7, 8, 9, 10 and 11. The approach is obviously for engineers and not meteorologists or oceanographers. *Subject Headings:* **1. Wind waves 2. Wave heights 3. Wave damage 4. Wave action 5. Marine engineering 6. Textbooks.**—*M.R.*

4.3–185 551.557:551.510.535:621.396

Jones, R. E., Millman, G. H. and Nertney, R. J., **Scientific report on the heights of ionospheric winds as measured at long radio wavelengths.** Pennsylvania. State College, Ionosphere Research Laboratory, Contract AF19(122)-44, Scientific Report No. 36, April 30, **1952.** 18 p. 12 figs., 22 refs., 14 eqs. **DWB**—The existence of winds in the ionosphere can be shown using the results obtained from spaced receivers. The height of these winds must occur at or below the reflection level of the frequency used (in this case 150 kc sec^{-1} pulses). A method for obtaining this additional information is developed and a frequency distribution of apparent wind heights is given. The daytime winds, measured at 150 kc sec^{-1} probably occur around the 75 km height, the nighttime winds between 83 to 100 km. *Subject Headings:* **1. Ionospheric winds 2. Radio wave reflection. I. Pennsylvania. State College II. Contract AF19(122)-44.**—*A.A.*

4.3–186 551.557:551.542.1

Väisälä, Vilho (*Univ. of Helsinki, Inst. Met.*), **Gradient wind parabola.** *Geophysica*, Helsinki, 4(1):28–30, **1951.** **DWB**—The author uses a method of representing the relation between gradient wind and geostrophic wind, slightly different from that of PETTERSSEN (*see item* 10–62, Oct. 1950, *MAB*). He obtains the formula $U=u+u^2$; $U=V/Rf \cos \phi$; $u=v/Rf$; V—geostrophic wind velocity; v—actual wind velocity; $f=2\Omega \sin \phi$—the Coriolis parameter; R—curvative radius of the trajectory. *Subject Headings:* **1. Gradient winds 2. Geostrophic winds. I. Petterssen, Sverre.**—*A.A.*

4.3–187 551.557.3:551.511

Hovmöller, Ernest (*Univ. of Stockholm*), **A comparison between observed and computed winds with respect to their applicability for vorticity computations.** *Tellus*, 4(2):126–134, May **1952.** 7 figs., 5 refs., 17 eqs. **MH-BH**—The insufficiency of computed height values for computations of derivatives such as vorticity and convergence, at least for the 300-mb and higher levels, is illustrated by theoretical and practical examples, and it is recommended to make more extensive use of observed winds. This gives a possibility to take into account the cyclostrophic and other nongeostrophic wind components for the vorticity computation which is the first step in the numerical forecasting methods (CHARNEY, 1951). *Subject Headings:* **1. Vorticity computations 2. Nongeostrophic wind components.**—*Author's abstract.*

4.3–188 551.557.31:551.547.31

Arakawa, Hidetoshi, **Diurnal variation of wind velocity and pressure in the upper atmosphere.** *Papers in Meteorology and Geophysics*, Tokyo, 2(2):129–131, June **1951.** fig., 2 refs. **MH-BH**—On the basis of a harmonic analysis of a ten-year record of hourly wind and velocity data obtained at the Mt. Fuji Observatory and of a harmonic analysis of the pressure records for the same period at the Central Meteorological Observatory, Tokyo, the author shows that the phase of the semidiurnal tide at Mt. Fuji is about half an hour behind that observed at Tokyo. A high negative correlation was repeated between daily march of pressure and that of wind speed. An analysis of the relationship between hourly departures from mean pressure and hourly departures from mean wind velocity, expressed in a regression equation "suggests that some percentage of the released potential energy due to the lowering of the isobaric surface will contribute to the increase of wind speed in the upper atmosphere." *Subject Headings:* **1. Upper atmosphere 2. Diurnal wind variations 3. Diurnal pressure variations 4. Harmonic analysis 5. Mt. Fuji Observatory, Japan.**—*I.L.D.*

4.3–189 551.557.32(263)

Kuhlbrodt, Erich, **Jahreszeitliche Änderung der Luftströmung in 0–5 km Höhe über dem atlantischen Gebiet 15°N-Äquator, 20–30°W.** [Seasonal changes of air currents in 0–5 km over the Atlantic 15°N-equator, 20–30°W.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:72–77, **1952.** 3 figs., 6 tables, 7 refs. **DWB**—Results of "Meteor"

(1925–1927) expedition and maritime aerological work of Deutsche Seewarte up to 5 km are analyzed for Feb., May, Aug. and Nov. and vertical change of resultant direction set out. *Subject Headings:* **1. Upper air winds 2. Equatorial Atlantic.**—*C.E.P.B.*

AQUEOUS VAPOR AND HYDROMETEORS

HUMIDITY AND CONDENSATION

See also: **Constitution of atmos. aerosols** (Junge), 4.3–9; **Nuclei of atmospheric condensation** (Junge), 4.3–10; **Vertical temp. and humidity variation with on- and offshore winds, SE England** (Pedlow), 4.3–152; **Cloudiness conditions, Locarno** (Thams), 4.3–214; **Appraisal of water resources** (Khosla), 4.3–230.

4.3–190 551.571.35:551.553:551.524.36:551.526.6(261)

Gordon, A. H., **Relation of atmospheric humidity at low levels over the sea to wind force and the difference in temperature between air and sea.** *Meteorological Magazine*, London, 81(964):289–295, Oct. 1952. 7 figs., 3 refs. **DWB**—Difference between e_o (saturation pressure at sea temperature T_s) and e_h (v.p. at ship's bridge) increases nearly linearly with increase of difference, bridge temperature $T_h - T_s$, up to $T_h - T_s = 0$ (wind force 0–3) to above 6°F (force >6). Data for all British O.W.S. up to 1950 are plotted. Frequencies of relative humidity are similarly examined; R.H. increases with wind force and tends to be high with $T_h > T_s$ or $T_s - T_h = 10° +$; *RH* is low when $T_s - T_h = 0 - 10°$F. *Subject Headings:* **1. Humidity variations 2. Air-sea temperature variations 3. North Atlantic Ocean.**—*C.E.P.B.*

4.3–191 551.574.1:536.42

A discussion on theory of liquids. *Royal Society of London, Proceedings, Ser. A*, 215(1120): 1–66, Nov. 6, 1952. 18 figs., 20 tables, refs., 94 eqs. **DWB**—Contributions: N. F. Mott, Introductory remarks; J. de Boer, "Theories of the liquid state;" R. Eisenschitz, "Transport processes in liquids;" E. N. da C. Andrade, "Viscosity of liquids"; F. C. Frank, "Supercooling of liquids"; N. N. Greenwood and R. L. Martin, "Discontinuities in the physical properties of supercooled liquids"; B. J. Mason, "The spontaneous nucleation of supercooled water." This discussion on the physics of liquids and the liquid-solid or solid-liquid transition has some meteorological interest. De Boer considers the theory of melting, Eisenschitz the average flow of mass, momentum or energy in diffusion, viscous flow or thermal conduction in liquids. Greenwood and Martin discuss the general changes in properties of liquids at the melting point. Mason's short paper gives an expression for the nucleation rate in small droplets of pure water, which predicts a 9-fold increase for a fall of temperature by 1°C around −40°. *Subject Headings:* **1. Condensation nuclei 2. Physics of supercooled water 3. Change of state. I. de Boer, J. II. Eisenschitz, R. III. da C. Andrade, E. N. IV. Frank, F. C. V. Greenwood, N. N. VI. Martin, R. L. VII. Mason, Basil John.**—*C.E.P.B.*

4.3–192 551.574.1

Reiss, Howard (*Celanese Corp. of America, Summit, N. J.*), **Theory of the liquid drop model.** *Industrial and Engineering Chemistry*, 44(6):1284–1288, June 1952. 3 figs., 28 refs., 35 eqs. **DLC**—The author reviews the "classical nucleation theory" introduced by Volmer and Farkas, developed by Becker and Döring and presented in its most modern form by Frenkel and Zeldowich. In this theory, condensation nuclei are regarded as small liquid incompressible spherical drops, the definition of whose free energy, together with the determination of equilibrium distribution, serves as a basis for calculation of the rate of nucleation. After pointing out some shortcomings of this approach, the author introduces his own "statistical theory" of nucleation based on "the statistical derivation of the equilibrium distribution of embryos." A configuration picture and a curve of the statistical distribution function are presented. *Subject Headings:* **1. Condensation nuclei 2. Condensation processes.**—*G.T.*

4.3–193 551.574.1:551.521

Reynolds, S. E., Hume, William, II and McWhirter, Max (*New Mexico, Inst. of Mining and Technology, Socorro*), **Effects of sunlight and ammonia on the action of silver-iodide**

particles as sublimation nuclei. *American Meteorological Society, Bulletin*, 33(1):26–31, Jan. 1952. 4 figs., 4 refs. **MH-BH**—Report on experimental determination of the behavior of silver iodide particles exposed to mineralite ultraviolet radiation and to sunlight, with or without addition of ammonia. It was found that concentration of effective nuclei in AgI will noticeably decrease under exposure to sunlight or ultraviolet radiation. By adding ammonia the AgI nuclei become re-activated. Data obtained during the experiments are presented on graphs. It is pointed out that addition of ammonia before exposure to sunlight will decrease rather than increase the number of effective silver iodide nuclei. An explanation of this phenomenon is offered. *Subject Headings:* **1. Silver iodide 2. Sublimation nuclei 3. Sunlight effects 4. Ultraviolet radiation.**—*G.T.*

4.3–194 551.574.2

Baumgartner, A., **Beobachtungen an Kondensfahnen hinter Flugzeugen mit Strahltriebwerken.** [Observations on condenstion trails behind aircraft with radial engines.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:295–298, **1952.** 2 figs., 7 refs. **DWB**—It was observed that curved condensation trails spread out only on the convex side, and the mushroom shaped extensions apparently grew horizontally. Several other peculiarities are described. *Subject Headings:* **1. Artificial condensation 2. Condensation trails.**—*C.E.P.B.*

ICING OF AIRCRAFT

See also: **Forecasting jet aircraft condensation trails** (Appleman), 4.3–82.

4.3–195 551.574.7:629.13

Brun, E., **Le givrage des avions.** [The icing of airplanes.] *La Météorologie*, 4th Ser., No. 9:78–81, Jan./March **1948.** tables, eqs. **DWB**—Of three causes of icing, only capture of supercooled droplets is important. Author then calculates rise of temperature of aircraft surface due to friction and compression of incident air and concludes that icing does not occur above −3°C on an aircraft flying at 100 m/sec or −12°C at 200 m/sec. Method of capture of droplets is also discussed. *Subject Heading:* **1. Icing of aircraft.**—*C.E.P.B.*

4.3–196 551.574.7:629.135

Dryden, Hugh L. (*Dir. NACA*), **The role of physics in aeronautical development.** *Physics Today*, N. Y., 5(5):14–24, May **1952.** 11 figs. **DWB**—Present state and future objectives of physical research on aeronautical problems connected with higher speed and altitude of aircraft flight, with aircraft propulsion; with materials and structures, with condensation icing and the reduction of aircraft noise are reviewed. The figures presented include an interferogram for flow around airfoil with turbulent boundary layer, diagrams of equipment for study of air flow and of condensation, photos of luminosity and shock wave formation, of flow about 30° wedge and of water droplets freezing on a cooled plate, etc. *Subject Headings:* **1. Icing of aircraft 2. Condensation 3. Aeronautics.**—*G.T.*

4.3–197 551.574.7:551.589.1(691)

*§Emon, Jean, **Le givrage dans l'Océan Indian sud-ouest.** [Icing in the southwest Indian Ocean.] *Madagascar. Service Météorologique, Publication*, No. 9, Jan. **1948.** 41 p. charts, 7 tables, 8 refs. **DWB**—A thorough analysis of unusual situations which resulted in: 1) icing at 3100 m in clouds (Oct. 20, 1944), 2) an unusual snowfall (July 13, 1944) at Reunion and 3) a second case of icing at 3000 m (Dec. 1, 1946). Based on aerological data for June 1944–July 1945, tables showing height of zero isotherm and dates on which icing would be possible are presented. Actual wind, temperature and humidity data are tabulated for the periods just prior to and during the ice and snow formations mentioned. Actual soundings and surface synoptic charts for the 3 cases are included, and an explanation given for these unusual occurences, especially in trade or intertropical convergence seasons. *Subject Headings:* **1. Icing of aircraft 2. Synoptic climatology 3. Synoptic aerological studies 4. Madagascar 5. Southwest Indian Ocean. I. Madagascar. Service Météorologique.**—*M.R.*

4.3–198 551.574.7:629.135

Fraser, D., Pettit, K. G. and Bowler, E. H., **Criteria for the design, assessment and control of icing protection systems.** *Institute of the Aeronautical Sciences, N. Y., Preprint,* No. 369, Jan. 28–Feb. 1, **1952.** [12 p.] 8+figs., 17 refs. Price: 75¢. Also: *Aeronautical Engineering Review,* 11(7):44–52, July **1952. MH-BH**—Icing data are classified into 2 groups—a "severity" group which affects the design and a "distribution" group which is of operational significance. The design requirements depend largely on the liquid water content of the air and the below-freezing temperatures. Drop size is also important. The basis on which icing data should be used is considered. The meteorological design requirements, design assessment, operational requirement, the need for further measurement and the control of icing protection are discussed. *Subject Heading:* **1. Icing prevention.**—*N.T.Z.*

4.3–199 551.574.7:551.551:629.13.014.1

Gelder, Thomas F. and Lewis, James P., **Comparison of heat transfer from airfoil in natural and simulated icing conditions.** *U. S. NACA, Technical Note,* No. 2480, Sept. **1951.** 51 p. 19 figs., 2 tables, 7 refs., 13 eqs. **DWB**—Numerous tests were made in a specially constructed laboratory tunnel to simulate natural icing conditions, and in the free air, to show the difference between heat transfer, melting, evaporation, water drop impingement and run-back, etc. in the laboratory and in nature. Correlations are shown in numerous graphs and photographs show comparative accretions, etc. as well as equipment. Results: 1) degree of wetness approximately the same; 2) turbulence level in tunnel different, causing transition from laminar to turbulent heat transfer at about 10^6 (Re) in tunnel; 3) calculations based on tunnel data overestimate the amount of heat required for de-icing. *Subject Headings:* **1. Turbulent transfer of heat 2. De-icing of aircraft 3. Icing research.**—*M.R.*

4.3–200 551.574.7:551.576.1

Müller, H., **Eine bemerkenswerte Vereisungslage am 16. Juli 1951.** [A remarkable icing situation on July 16, 1951.] *Meteorologische Rundschau,* 4(11/12):213–214, Nov./Dec. **1951.** fig. **DWB**—A radiosonde ascent at Erlangen, through NbSt. and heavy rain in a high level trough, met heavy icing at 3300 m (680 mb) at a temperature of −0.2°C. Deposit of 2 kg ice forced balloon down to 1300 m, after which it rose to 17 km without further icing. Graphs shown. *Subject Heading:* **1. Icing in clouds.**—*C.E.P.B.*

4.3–201 551.574.7:629.13

Pettit, K. G., **"The Rockcliffe Ice Wagon" and its role in Canadian icing research.** *Royal Meteorological Society, Canadian Branch,* [*Publications*], 2(5), **1951.** 15 p. 4 figs., 19 refs. Mimeographed. **DWB**—Describes the North Star aircraft known as "The Rockcliffe Ice Wagon" with particular emphasis on its electro-thermal propeller and wing de-icing systems. A survey is given of the cloud physics project whose purpose was to study liquid water content, cloud droplet size and droplet size distribution. Descriptions of a number of instruments (rotating disc rate of icing meter, cloud density meter, cloud droplet camera, rotating cylinder apparatus, etc.) are included as well as graphical presentation of the data collected on liquid water content and temperature of supercooled clouds during the icing research flights in 1950 and 1951. *Subject Headings:* **1. Icing research 2. Icing instruments 3. Aeronautical meteorology.**—*M.L.R.*

4.3–202 551.574.7:629.13

Smyth, Ross (*Trans-Canada Air Lines*), **Flight in ice.** *Canadian Aviation,* Toronto, 25(3,4):34, 76, 78; 50, 76–82, March; April **1952. DLC**—Basic knowledge of icing on aircraft is summed up for the information of the average pilot. Ice encountered in flight is classified according to its heaviness, its physical properties, its altitudinal and areal distribution, its frontal origin and its rate of accretion. The effect of ice on different parts of aircraft, de-icing and anti-icing methods and operational problems are discussed. *Subject Headings:* **1. Icing of aircraft 2. Aeronautical meteorology.**—*G.T.*

FOG

See also: **Cloudiness conditions, Locarno** (Thams), 4.3–214.

4.3–203 551.575.1:631.4

Landeck, J. and Uhlig, Siegfried, **Kondensationserscheinungen über Brachland.** [Condensation phenomena over fallow ground.] *Meteorologische Rundschau*, 5(5/6):107, May/June, **1952.** fig. **MH-BH**—On March 7, 1950, at Heidelberg in strong radiation a fallow field warmed more than a nearby cultivated field, causing more vigorous vertical circulation and a shallow layer of mist. *Subject Headings:* **1. Fog formation 2. Soils.**—*C.E.P.B.*

4.3–204 551.575.1:551.588.6

Rossmann, Fritz, **Das Rauchen der Wälder nach Regen.** [Steaming forests after rain.] *Meteorologische Rundschau*, 5(5/6):105, May/June, **1952. MH-BH**—When prolonged heavy rain ceases suddenly, threads of mist often appear above the crown of forest. They are attributed in rising currents in relatively slightly warm saturated air. *Subject Headings:* **1. Forest steaming 2. Forest influences.**—*C.E.P.B.*

4.3–205 551.575.5(4)

Rodewald, Martin, **Die Nebelkatastrophe des argentinischen MS. Maipu vor der Aussenweser am 4. Nov. 1951 morgens.** [The fog catastrophe of the Argentine MS Maipu off the Weser mouth on morning of Nov. 4, 1951.] *Wetterlotse*, No. 32:1–6, Nov. **1951.** fig. **DWB**—A collision occurred in an extensive dense fog behind a cold front. The radiation fog was carried ENE by the maritime polar air. *Subject Headings:* **1. Fog formation 2. Marine disasters 3. North Sea.**—*C.E.P.B.*

CLOUDS

See also: **Direction of rotation of pampero whirl** (Georgi), 4.3–183; **Remarkable icing situation, July 1951** (Müller), 4.3–200; **Influence of cloudiness on beginning of twilight** (Malsh), 4.3–289.

4.3–206 551.576.1:551.558.21:551.21(45)

Affronti, Filippo, **Formazione nuvolosa sull'Etna in eruzione.** [Cloud formation over Etna in eruption.] *Rivista di Meteorologia Aeronautica*, 11(3/4):41–44, July/Dec. **1951.** fig. Italian, French, English and German summaries p. 41. **MH-BH**—A beautiful spiral cumuliform cloud (shown in photo) was observed on Nov. 24–25, 1950 over Etna (base 2000 m, top 4500 m) during its recent eruption. An analysis of upper air and surface winds and synoptic conditions, shows that the cloud was not a phenomenon associated with the volcanic eruption but an orographic cloud (well known to natives as the "contesso del vento") which the author classifies as "lenticolare multipla" or multiple altocumulus lenticularis with spiral form and one layer merging into another. *Subject Headings:* **1. Lenticular clouds 2. Orographic clouds 3. Volcanic eruptions 4. Etna, Sicily.**—*M.R.*

4.3–207 551.576.1:629.135.2

Hopkins, H. G., **Unusual condensation trails.** *Meteorological Magazine*, London, 81(964): 315–316, Oct. **1952. DWB**—June 4, 1952, in Middlesex a plane flying level left a condensation trail which changed to a clear lane when it entered a tenuous cloud. The trail widened, the lane did not. *Subject Headings:* **1. Condensation trails 2. Negative condensation trails.**—*C.E.P.B.*

4.3–208 551.576.11:551.509.317(45)

§Gazzola, Adriano, **Formazione sulla Val Padana di nubi dovute a rimescolamento di uno strato limitato.** [Formation of mixing clouds in a limited layer over the Po Valley.] *Rivista di Meteorologia Aeronautica*, 11(3/4):18–25, July/Dec. **1951.** 3 figs. Italian, French, English and German summaries p. 18. **MH-BH**—The details of a situation which gave rise to "mixing clouds" in the Po Valley (Milan) during Sept. 19–24, 1951 are analyzed synoptically and by means of aerological sounding diagrams (for Milan). The daily log of cloud conditions at

Milan is also given in detail. The cold pool of air (northeast type) in the Po Valley was overrun by very warm Atlantic air (NW changing to WSW). The resulting stratocumulus layer persisted for several days. *Subject Headings:* **1. Cloud formation 2. Synoptic aerological studies 3. Milan, Italy.**—*M.R.*

4.3–209 551.576.11

Rackliff, P. G., **Eddy structure at the base of a cumulonimbus cloud.** *Meteorological Magazine*, London, 81(964):314–315, Oct. **1952.** photo. **DWB**—At Singapore March 12, 1952, well defined eddy structure was seen at base of a CuNb cloud, persisting for about 15 min with little change. *Subject Headings:* **1. Cloud structure.**—*C.E.P.B.*

4.3–210 551.576.11:551.501.7:534

Zanotelli, Guglielmo (*Rome, Ist. Naz. di Geof.*), **Sondaggio acustico delle nubi.** [Acoustical sounding of clouds.] *Annali di Geofisica*, 5(1):55–76, Jan. **1952.** 10 figs., 3 refs. English summary p. 75–76. **MH-BH**—An elaborate analytical method is found for determining reflection indexes of waves at various frequencies in the audible scale, as functions of droplet size and number in the reflecting cloud. Values of audibility of the reflected sound with and without an amplifier are calculated. It is pointed out that this method of estimating drop size and number by recording the intensity of reflected sounds at varying frequencies should be very useful in observing quick changes taking place in a cloud owing to evaporation, condensation, cohesion, etc., particularly during stormy conditions. *Subject Headings:* **1. Acoustical soundings 2. Cloud physics 3. Drop size distribution.**—*G.T.*

4.3–211 551.576.2:551.591:522

Hess, Seymour L. (*Dept. of Met., Florida State Univ.*), **Cloudiness in relation to choice of astronomical sites.** *Science*, 115(2998):655–656, June 13, **1952.** **DWB**—The use of photoclimatic photometry in astrophysical research requires accurate data on nocturnal cloudiness, the spatial distribution of which may differ considerably from diurnal cloudiness. At Yuma, Arizona nighttime clouds tend to be of the stratiform type and are usually caused by frontal storms and cyclonic disturbances so that the higher clouds are relatively independent of the surface factors producing a minimum of cloudiness near Yuma. The author believes that the entire southwestern United States including southern California, Arizona, New Mexico and western Texas are equally suitable for photoelectric photometry of stars. *Subject Headings:* **1. Photoelectric photometry 2. Nocturnal clouds 3. Visibility 4. Astronomical observatories 5. Yuma, Arizona.**—*I.L.D.*

4.3–212 551.576.3(494):522:523.74

Thams, J. Chr., **Die Klimatischen Verhältnisse für Sonnenbeobachtungen in der Schweiz.** [Climatic conditions for solar observations in Switzerland.] *Orion*, Basel/Berne, No. 26:51–53, Jan. **1950.** Abstracted from reprint. **DWB**—Author presents tables showing the number of days on which sunspots cannot be observed from one or more than one of the three Swiss stations; Zurich, Arosa and Locarno-Monti. The tables are based on 14 years' monthly and annual means and author concludes that practically continuous observation of sunspots can be made from the three combined stations, provided that adequate equipment is available. *Subject Headings:* **1. Cloudiness 2. Sunspot observation 3. Switzerland.**—*G.T.*

4.3–213 551.576.36(438)

*Michałczewski, Jerzy, **Częstotliwość wystepowania rodzajów chmur w Zakopanem.** [Frequency of forms of clouds at Zakopane.] *Przegląd Meteorologiczny i Hydrologiczny*, 1950/1951:117–122, **1951.** 2 tables. **DWB**—Cloud observations show that: 1) Ac, Sc and Ns clouds appear most frequently, 2) the Cs, Ci, As, St and Cu+Cb less frequently and 3) Cc clouds are very rare. *Subject Headings:* **1. Cloud frequencies 2. Cloud observations 3. Zakopane, Poland.**—*W. Tomczykowski.*

4.3–214 551.576.36 551.575.36(494)

*Thams, J. Chr. (*Dir. Ticinese Obs. of Swiss Cent. Meteorologica*), **Le condizioni di nebulositá a Locarno.** [Cloudiness conditions at Locarno.] *Geofisica Pura e Applicata*, Milan,

15(3/4):206–214, Oct./Dec. 1949. 3 figs., 7 tables, 12 refs. English, French and German summaries p. 206. Abstracted from reprint. **DLC**—The cloudiness regime of the southern Alps is discussed on the basis of 40 years of cloud observations (1901–40) made at Locarno (although records date back to 1876). Mean monthly, seasonal and annual values for 3 regular times of day, extremes and frequencies of clear and cloudy days, cloudy days with precipitation, and days with fog are given in tables and on graphs for Locarno and compared with Zürich, Milan and Davos, showing the marked effect of the Alps on Locarno weather. Practically no fog and less cloudiness are observed at Locarno throughout the year than at other places mentioned. Year to year variability is great in these elements, however. *Subject Headings:* **1. Cloud frequencies 2. Fog frequencies 3. Topographic effects 4. Alps 5. Locarno, Switzerland.**—*M.R.*

PRECIPITATION

See also: **Precipitation measurement** (Bac), 4.3–27; **Growth of instability from precipitation** (Ray Choudhuri), 4.3–123; **Winter storm, Los Angeles** (Carr), 4.3–130; **Floods, Italy, autumn 1951** (Pardé), 4.3–240; **Hawaiian climate; human and plant geography** (Leopold), 4.3–246; **Tree species distribution in relation to rainfall and soil texture, Sudan** (Smith), 4.3–275; **Meteorological observations in forest nursery during drought** (Jedlovski), 4.3–277.

4.3–215 551.577:551.482

Friedrich, Wilhelm, **Zur Berechnung der Gebietsniederschläge von Flussgebieten.** [On calculating the regional precipitation of river basins.] *Deutsches Gewässerkundliches Jahrbuch, Besondere Mitteilungen*, No. 4:56–71, **1952.** 2 figs., 7 tables. **GB–MO**—Regional rainfall, 1891–1935, of the Havel-Spree region was computed: 1) from average maps of rainfall for each month, half-year and for the year; 2) from maps for each individual year and the percentage seasonal distribution at Berlin-Dahlem and at 3 representative stations. Results of 1) differed from true values by up to 10%, of 2) by up to 23% in summer months using only one station and over 11% with three. This accuracy is insufficient. If monthly values accurate to 10% are required, monthly charts must be drawn. *Subject Headings:* **1. Rainfall amount 2. River basins 3. Germany.**—*C.E.P.B.*

4.3–216 551.577(058)(569.4)

*Israel. Meteorological Service. **Annual rainfall summary.** Earliest issue received, 1947/48; last issue received 1950/51. Hakirya, 1949–**1951.** 4 pieces. entirely tables. In English and Hebrew. 1949/1950 and 1950/1951 issued as: *Israel. Meteorological Service, Series B*, No. 3/R–4/R. **DWB**—Detailed monthly rainfall data of each rainfall station in Israel are given. Its 1950/51 report contains a rainfall map for 1950/51 and a map giving the annual rainfall for the same year in percent of normal rainfall. *Subject Headings:* **1. Rainfall data 2. Annual summaries 3. Israel.**—*I.L.D.*

4.3–217 551.577.1:551.515.8

Barla, Mario, **La concentrazione idrogenionica delle acque di precipitazione atmosferica in relazione ai diversi sistemi frontali.** [The pH concentration in precipitation water in relation to various frontal systems.] *Revista di Meteorologia Aeronautica*, 11(3/4):38–40, July/Dec. **1951.** Italian, French, English and German summaries p. 38. **MH-BH**—Measurements were made from June 1949 to July 1951 with a sensitive electrometer with an accuracy of .01 pH. The precipitation was classified according to 3 types: 1) warm front (snow and rain), 2) cold front with warm air (a) all along the front and (storm and snow) (b) in forward portion only (rain or snow, drizzle and storm) and 3) occlusion type. In all, 48 determinations were made at beginning and end of rain in each case. The pH was always lower at the end of the rain than at the beginning. *Subject Headings:* **1. Precipitation analysis 2. Frontal type precipitation.**—*M.R.*

4.3–218 551.577.3

Hohendorf, Eugeniusz, **Dotychczasowe metody oblizén dzielnika opadowego a metoda średnich dziesiecioletnich.** [Precipitation ratio computed from averages of ten years.]

Towarzystwo Naukowe, Toruń, Sec. A, (Math.-Phy.), 2(1), **1950.** 61 p. 9 figs., 27 tables, 20 refs., 20 eqs. English summary p. 58–59. **DWB**—HELLMANN's precipitation ratio $Q=\frac{\max}{\min}$ and GORCZYŃSKI's $P=\frac{\max\text{-}\min}{\text{mean}}$ are discussed and compared. GORCZYŃSKI's formula is applied to various arrangements of precipitation data from 33 European and 13 American stations for the period 1851–1930. It is found that the best results are obtained by using the average precipitation ratio for 10-year periods and applying a reduction factor to any precipitation ratio representing a different number of years. *Subject Headings:* **1. Precipitation ratios. I. Hellmann, Gustav II. Gorczyński, Władysław.**—*G.T.*

4.3–219 **551.577.3**(569)

*Jordan (Hashemite Kingdom). Dept. of Lands and Surveys, **Rainfall in Transjordan in the season 1949–1950.** *Jordan (Hashemite Kingdom). Dept. of Lands and Surveys, Technical Paper*, No. 18, [1951]. 2 p.+4 figs., 9 tables, map (in pocket). **DWB**—The data included in this report were obtained at 56 stations whose location, altitude and date of establishment are indicated. Values of monthly and cumulative total rainfall, number of rainy days and daily intensity of rain in 1949–1950, seasonal comparison from 1937/38 to 1949/50, maximum rainfall in 24 hrs from 1941 to 1950 and number of rainy days from 1938 to 1951 are tabulated. Diagrams on rainfall reduced to 10-day periods and on monthly and seasonal rainfall indexes in the 4 administrative districts are presented. Rainfall during the season under report was slightly above normal with a maximum snow depth of 37.5 cm at Amman and a minimum temperature of −10°C. *Subject Headings:* **1. Precipitation variations 2. Transjordan. I. Walpole, G. F.**—*G.T.*

4.3–220 **551.577.3**

Gorczyński, Władysław, **O wahaniach długoletnich wysokości rocznej opadow i dzielnika opadowego.** [Variability of annual totals of rainfall and precipitation ratio.] *Towarzystwo Naukowe, Toruń, Sec. A, (Math.-Phy.)*, 2(5), **1951.** 14 p. 3 figs., 4 tables, 7 refs. English summary p. 14. **DWB**—The statistical method of HELLMANN's precipitation ratio $Q=\frac{\max}{\min}$ is discussed and applied to a few examples. A table computed according to MCEWEN gives % values which must be added to or reduced from Q (as obtained from any period ranging from 5 to 500 years) in order to obtain Q corresponding to a 50-year period. Annual totals and ten-year maximum and minimum precipitation amounts are presented for Padua, Milan, Edinburgh, Klagenfurt, Boston, Madras, San Diego, Karachi, La Serena and Buenos Aires for periods of varying length between 1731 and 1940. A special point is made of the annual precipitation of 1184 mm at Warsaw in 1883 as compared to the annual mean of 564 mm for the period 1811–1940. *Subject Headings:* **1. Rainfall variations 2. Precipitation ratios. I. Hellmann, Gustav II. McEwen, G. F.**—*G.T.*

4.3–221 **551.577.37**

*Zimmermann, Gerhard, **Die Abhängigkeit der Wolkenbrüche von der Orographie und von bestimmten Wetterlagen.** [The dependence of cloudbursts on orography and on certain weather situations.] *Meteorologische Rundschau*, 5(7/8):128–131, July/Aug. **1952.** fig., 12 tables, 8 refs. **DWB**—From German data 1934–40, occurrences of 100 mm or more, 7 h–7 h, were tabulated and distribution charted. Expectancy increased from 1 in 407 yrs below 100 m to 1 in 10 yrs above 800 m. Maximum frequency Aug., July (usually with thunder), minimum Jan.–March. Associated weather types and upper winds are tabulated. *Subject Headings:* **1. Excessive rainfall frequencies 2. Germany.**—*C.E.P.B.*

SNOW

4.3–222 **551.578.4**(410)

Hawke, E. L. and Champion, D. L., **Report on the snow survey of Great Britain for the season 1950–51.** *Journal of Glaciology*, 2(11):25–37, March **1952.** figs. **DWB**—Includes a summary of snowfall month by month (excessive in northern uplands, moderate in lowlands),

aily values of snow cover on mountains and snowfall on British coastal waters. *Subject Headings:* **1. Snow surveys 2. Snow cover 3. Snowfall data.**—*C.E.P.B.*

4.3–223 551.578.42(41/2)

*Ashmore, S. E., **Records of snowfall in Britain.** *Royal Meteorological Society, Quarterly Journal,* 78(338):629–632, Oct. **1952.** 2 figs., table, 3 refs. **DWB**—Slight falls of snow, specially at night, may go unrecorded and "days of snow" are too few at some stations. British stations are classified into 5 categories according to completeness of records and some uggestions are made for correcting defective records. *Subject Headings:* **1. Snowfall data . Great Britain.**—*C.E.P.B.*

4.3–224 551.578.42:551.578.46(4)

*Germany. Reichsamt für Wetterdienst, **Vergleich der Schneeverhältnisse von Russland, Polen und Norddeutschland.** [Comparison of snow conditions in Russia, Poland and North Germany.] Berlin, **1942.** 3+p. 4 tables, 27 maps, refs. **DWB** -A great number of maps vith short explanations and some numerical data are given for: the number of days with nowfall, the mean date of the first and last snow cover, number of days with snow cover, naximum of the average snow depth (value and date), average monthly maximum snow depth for each month and the whole winter), greatest maximum snow depth, dates of freezing and breaking of rivers. The area covered on different series of maps is east Europe from 20°E, Poland and northern Germany (northwards from 50°N) and, in surprising detail, the south European Soviet Union including the Caucasus region. *Subject Headings:* **1. Snowfall charts . Snow cover charts 3. Freezing temperatures 4. Germany 5. Poland 6. European J.S.S.R. 7. Caucasus.**—*A.A.*

4.3–225 551.578.46

Grunow, Johannes, **Zum Wasserhaushalt einer Schneedecke. Messungen der Schneelichte beim Observatorium Hohenpeissenberg.** [On the water balance of a snow cover. Measurements of snow depth at the Hohenpeissenberg Observatory.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 38:385–393, **1952.** 4 figs., table, 11 refs. **DWB**—The factors in the water balance of a snow layer are summarized and the setup at Hohenpeissenberg (977 m) described, with illustrations of thaw water gage and snow cover for density profiles. Diagrams show day by day for 1950/51 and 1951–52 global radiation, temperature extremes, water content, density and depth of snow. *Subject Headings:* **1. Snow cover 2. Snow density 3. Hohenpeissenberg, Germany.**—*C.E.P.B.*

4.3–226 551.578.46

Kölzer, Joseph, **Die Schneeverhältnisse in den Voralpen im Winter 1951/52.** [Snow conditions in the Alpine foreland in winter 1951/52.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 38:178–181, **1952.** 4 tables, 5 refs. **DWB**—Tables of temperature, precipitation and snow cover are given for a number of places for this remarkable winter, and discussed. *Subject Headings:* **1. Snow cover 2. Germany.**—*C.E.P.B.*

4.3–227 551.578.46

Lauscher, Friedrich and Roller, Maria (*Vienna*), **Über die Struktur der Schneedeckenzeit in einem Alpental (Lunz am See).** [The structure of the snow cover period in an Alpine Valley (Lunz am See).] *Wetter und Leben, Sonderheft,* No. 1:15–19, May **1952.** 2 tables. **MH-BH**—A detailed description of the snowfall regime at Lunz am See based on a fifty year average of data of first snowfall, first and last snow cover and beginning and end of winter snow cover, etc. The frequency distribution of length of snow cover period and the distribution of number of days with snow cover for every year from 1900–1950 are given in tables. *Subject Headings:* **1. Snow cover duration 2. Snow frequencies 3. Long period records 4. Lunz am See, Austria.**—*I.L.D.*

4.3–228 551.578.46:551.311.1

*Tollner, Hanns, **Der Zustand der Gletscher der Glockner- und Sonnblickgruppe im Spätsommer 1951.** [The conditions of the Glockner and Sonnblick glaciers in September

1951.] *Wetter und Leben*, Vienna, 3(11/12):252–255, Dec. 1951. 2 tables. **MH-BH**—The firn snow boundary and extent and number of ice fields were at lower than normal elevations. Glacier surfaces with a southward orientation showed fewer exposures of older firn snow layers. The color of the firn snow cover varied from bright to dull white. The large glaciers with thin glacial tongues retreated less than in the previous year while the small glaciers either remained stationary or even advanced. Exact statistical data are given on these phenomena, especially on the behavior of the glacier tongues and on the density of firn snow layers; data for the latter two characteristics are presented in tables. The advance of the small glaciers is attributed to snow layers which persisted during the cloudy summer of 1950/51. *Subject Headings:* **1. Glaciers 2. Glacial ablation 3. Firn 4. Ice fields 5. Austria.**—*I.L.D.*

HYDROMETEOROLOGY

See also: **Summation curves of daily discharges . . .** (Andreianov), 4.3–30.

4.3–229 551.579(438)

Debski, Kazimierz, **Zagadnienia hydrologii kontynentalnej we wspolczesnej nauce polskiej.** [Problems of continental hydrology in Polish contemporary science.] *Przegląd Meteorologiczny i Hydrologiczny*, 1950/1951:261–280, **1951. DWB**—A report which considers: potamology, limnology. pedohydrology, geohydrology and climatology in connection with hydrometeorology. The contemporary literature on hydrology, the work and attainments of the P.I.H.M., etc. and, most important, the problem of continental hydrology are discussed in detail. Numerous suggestions for the development of the science of hydrology are given. *Subject Headings:* **1. Hydrology 2. Hydrometeorology 3. Poland.**—*Wanda Tomczykowski.*

4.3–230 551.579:551.573(54)

Khosla, A. N. (*Irrig. and Navigat. Com., New Delhi*), **Appraisal of water resources: analysis and utilization of data.** (In: United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N. Y. 1949, **Proceedings, v. 4, Water Resources,** p. 64–77, **1951.** 6 figs., 7 tables, 8 refs.) **DWB**—The author proposes, what he believes to be, an "universal formula" for the monthly evapotranspiration loss (L_m) in inches $L_m = \frac{Tm - 32}{9.5}$, where T_m is the monthly mean temperature of °F. For $T_m < 40$°F he gives the provisional values:

T_m	40°	30°	20°	10°	0°F
L_m	.84	.70	.60	.50	.40 inches

The annual loss is $L_a = a T_a$, where a is constant for a given catchment area, which varies from .43 to .57 for 19 cases examined (almost all in the United States). The important studies of THORNTHWAITE and of WUNDT on this subject are not even mentioned. The author applies his formula to a comprehensive calculation of runoff for the greater rivers in India. The average calculated runoff for India is 17.8″ compared with 41.0″ rainfall. *Subject Headings:* **1. Hydrologic cycle 2. Evapotranspiration 3. Runoff 4. India 5. United States.**—*A.A.*

4.3–231 551.579

Merriam, Carroll F., **Evaluation of two elements affecting the characteristics of the recession curve.** *American Geophysical Union, Transactions*, 32(4):597–600, Aug. **1951.** 4 figs., eq. **DWB**—The author presents an empirical method for evaluating the depletion of the ground water storage and the rate of decline of that portion of the runoff which reaches the river system directly without ever entering ground water storage. Hydrographs of these components which influence, independently of each other, the actual recession curve are developed and envelope curves are applied to eliminate variables which are assumed to approach zero as a limit. *Subject Headings:* **1. Runoff 2. Ground water storage.**—*I.L.D.*

4.3–232 551.579:551.501.9(438)

Otwarcie laboratorium hydraulicznego i stacji tarowania Pánstwowego Instytutu Hydrologiczno-Meteorologicznego. [Inauguration of the hydrological laboratory and gage station

of the State Institute of Hydrology and Meteorology.] *Przegląd Meteorologiczny i Hydrologiczny*, 1950/1951:250–251, **1951. DWB**—Description of the laboratory and gage station with the instruments. *Subject Headings:* **1. Hydrologic institutes 2. Hydrometeorology 3. Poland. State Institute of Hydrology and Meteorology 4. Poland.**—*Wanda Tomczykowski.*

4.3–233 551.579:06(497.1)

Radošević, Milušin Dj., **Hidrometeoroloska služba FNRJ.** [Hydrometeorological Service of Yugoslavian FNR. (Federal People's Republic).] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik*, 1(2):85–87, **1948.** In Serbian. **DWB**—A brief review of the development in Yugoslavia of the Hydrometeorological Service which, in its present state, has been operating since 1947. Before this date the meteorological service was divided among many institutions and was ineffective. The hydrological service likewise did not have a satisfactory organization. The formation in 1947 of the united Hydrometeorological Service, like the analogous service in the U.S.S.R., facilitated a good development of the synoptic, agricultural, climatological and hydrological services. The progress of climatology and hydrology in the Soviet Union is said to confirm the correctness of this reorganization. *Subject Headings:* **1. Hydrometeorological services 2. Yugoslavia.**—*N.T.Z.*

4.3–234 551.579:628.1(07)

Riedman, Sarah Regal, **Water for people.** New York, Henry Schuman, **1952.** 151 p. **DWB**—Geological, historical, physical, chemical, biological, hydrological and meteorological aspects of water in liquid, solid and gaseous form and its use in economy, science, engineering and practical life are discussed in brief chapters adapted to the standards of juvenile readers. Simple drawings and explanatory diagrams contribute to the educational value of the text. The few easy experiments suggested in the book are well within the reach of a child. *Subject Headings:* **1. Hydrometeorology 2. Water resources 3. Juvenile literature. I. Tagawa, Bunji** (*illus.*).—*G.T.*

4.3–235 551.579:551.588.6

Smith, James L. and Crabbe, George A., Jr., **Progress report on the wooded watershed of the Michigan Hydrologic Research Station.** *Michigan Agricultural Experiment Station, East Lansing, Quarterly Bulletin*, 34(4):383–384, May **1952.** 7 figs. Abstracted from reprint. **DWB**—Three watersheds which are similar (except for cover) were selected for the study; two were farmland, the third was a typical farm woodlot. The greatest difference was found in the infiltration rate. The woodlot had no surface runoff, even after heavy rains. After eleven years of observation, clearing operations were completed in the winter 1951–1952 to give comparative hydrologic data under altered cover conditions. *Subject Headings:* **1. Hydrologic cycle 2. Forest influences. I. Michigan Hydrologic Research Station.**—*A.A.*

4.3–236 551.579:628.1(73/9)

†Thomas, Harold E. (*U. S. Geological Survey*), **The conservation of ground water.** New York, McGraw-Hill, **1951.** 327 p. 3 plates, tables, bibliog. p. 301–321. Price: $5.00. **DWB**—This survey of the present ground water situation in the United States begins with a general discussion of the hydrologic cycle and a description of the arid and humid regions and of the ground water reservoirs of the United States. This is followed by a consideration of 1) problems resulting from ground water development and use of reservoirs, pipe lines and watercourses, 2) ground water problems resulting from land occupancy, 3) increasing consumptive and nonconsumptive use of water and 4) current deficiencies and future needs for effective development of ground water, including a discussion of the legal aspects of ground water use and content. The appendix contains a table of the pumpage from major ground water reservoirs in order of magnitude and a bibliography on areal ground water studies. *Subject Headings:* **1. Water conservation 2. Hydrologic cycle 3. Ground water variations 4. Textbooks 5. United States.**—*I.L.D.*

4.3–237 551.579

United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N. Y. 1949, **Proceedings, v. 4, Water resources.** N. Y., United Nations, Dept. of Economic Affairs, **1951.** 466 p. illus. tables, bibliog. *United Nations Document,*

E/Conf. 7/7. Price: $4.50. **DWB**—An important document of international scientific collaboration. Contains 13 papers on the appraisal of water resources (2 papers on induced precipitation), 7 papers on water supply and pollution problems, a symposium with 6 papers on comprehensive river basin development, 8 papers on drainage basin management, 17 papers on water control structures, 4 papers on flood control and navigation, 17 papers on irrigation and drainage and 10 papers on hydro-power and other water uses. Each group of papers is accompanied by valuable discussions. Papers of meteorological significance are abstracted separately. *Subject Headings:* **1. Water resources 2. Hydrology.**—*A.A.*

4.3–238 551.579.1:631.6

Riddel, J. O. (*Irrigation Eng., Christchurch, N. Z.*), **Development of irrigation in a semi-humid climate: The Ashburton-Lyndhurst Project, New Zealand.** (In: United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N. Y. 1949, **Proceedings, v. 4, Water resources.** N. Y., United Nations, Dept. of Economic Affairs, **1951.** p. 375–378.) **DWB**—The annual rainfall is about 30", but hot dry winds, light soils and fast drainage decrease the amount of moisture available for plants so that irrigation is necessary. Technical and economic questions are discussed. *Subject Headings:* **1. Irrigation 2. Drainage 3. Ashburton County, South Island, New Zealand.**—*A.A.*

4.3–239 551.579.2:551.509.59

Wilson, Walter T., **Some fundamental problems and investigational techniques in snow melt forecasting.** *Western Snow Conference, Proceedings, Annual Meeting,* 19:47–57, April **1951.** Discussion by Wayne D. Criddle, p. 55–56. **DWB**—Administrative and technical problems are discussed at length. Author states that only about 5% of water equivalent of snow pack is ever due to stored rainfall and that air temperature is the least variable of all elements considered in hydrologic forecasting. Importance of stored rainfall, even if only 5% of water equivalent, emphasized in discussion. *Subject Headings:* **1. Hydrologic forecasting 2. Snow melt. I. Criddle, Wayne D.**—*M.R.*

4.3–240 551.579.4:551.577.37(45)

§Pardé, Maurice (*Grenoble, Univ. and School of Hydraulic Engineering*), **Les crues italiennes catastrophiques de l'automne 1951.** [The catastrophic floods of Italy in the autumn of 1951.] *La Houille Blanche,* 7(2):319–327, April **1952.** 3 figs. **DLC**—Precipitation of unprecedented quantity exceeding, in some places, the annual mean values by 20–49% in 72 hrs, led to exceptional floods in Calabria, Sicily and Sardinia during the second decade of Oct. 1951. Some data on precipitation and runoff are mentioned and the synoptic situation is described briefly. The floods were caused by a Bay of Biscay cyclone blocked by an anti-cyclone over the eastern Mediterranean Sea connected with very high pressure over Finland and Scandinavia. A detailed description of the Po River basin flood of Nov. 1951 is given with a synoptic chart and curves indicating the rise in water level of the Po at various points from Nov. 7 to 17. The damage caused to dams is discussed. Comparative data of maximum water level of the Po and Rhone rivers during earlier floods are tabulated. *Subject Headings:* **1. Flood intensities 2. Excessive precipitation 3. Flood damage 4. Po River 5. Italy.**—*G.T.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See also: **Climate—synthesis of weather (Durst),** 4.3–3; **Isanomaly chart of annual temp. variation** (Lautensach), 4.3–148; **Ecological geography, Ukraine; analogs in N. America** (Nuttonson), 4.3–269; **Tree species distribution in relation to rainfall and soil texture, Sudan** (Smith), 4.3–275.

4.3–241 551.582:656.7

*Hillebrand, R., **Flugklimatologische Studien am Flughafen Bremen.** [Aeronautical climatological studies at Bremen airfield.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 38;316–320, **1952.** 9 tables, 2 refs. **DWB**—Frequencies of ceiling under 700

and 400 ft and visibility under $1\frac{1}{4}$ and $\frac{5}{8}$ mi are tabulated by month and hour, for wind direction and strength, and for duration. *Subject Headings:* **1. Aeronautical climatology 2. Airports 3. Bremen, Germany.**—*C.E.P.B.*

4.3–2–242 551.582:551.586:63(47)

†*Kaĭgorodov, A. I., **Klimat BSSR, Zakhodniaĭ Belarusi i sumezhnykh krain.** [Climate of Byelorussia and its neighboring regions.] Minsk, Sel'gassektar, **1933–1934.** 2 v. numerous figs., 2 maps, tables, refs. In Belorussian; German titles. **DLC**—A comprehensive treatment of climatic conditions in the western part of Russia, (Byelorussia) preceded by a general outline of the concepts of climate and weather, stability and variations of climate in relation to atmospheric circulation; biological factors of climate, the influence of topography on the role of vegetation in the hydrologic cycle, the artificial modification of climate, etc. Chap. 2 takes up the length of day, duration of twilight and the height of the sun at noon for the latitudes 51°, 54° and 57°. Chap. 3 discusses the temperature regime. A complete analysis of the distribution and variations in time and space is accompanied by theoretical explanations, supported by actual observations and illustrated by synoptic charts. Methods of reduction and other climatological techniques, frequency and abnormalities of temperature, early and late frosts and their probability, cold waves, hot spells, duration of vegetation period and data on soil temperature are discussed. Chap. 4 reviews the general baric conditions in the northern hemisphere, weather conditions in highs and lows, daily and annual variations in pressure and their geographical distribution, the main paths of cyclones, the effect of the atmospheric centers, and harmonic analysis of the daily pressure variations. Chap. 5 considers wind and its relation to pressure gradient, frequency, velocity, annual cycle; calms and gales are treated and the methods of computation explained. A list of 125 stations with geographical coordinates and a chart of meteorological network for the territory between 51°–58°N lat., and 20°–35°W long. are added as well as a fairly good contour map in 6 colors in scale of 1–2,500.00. Vol. 2 contains chapters on: 1) Solar radiation, 2) Cloudiness, 3) Humidity and evaporation, 4) Precipitation. Chap. 5) on snow cover, snowfall and ice and 6) on thunderstorm and hail present a comprehensive and elaborate treatment of the subjects with theoretical considerations and discussions, supplemented by ample data. Chap. 7) discusses agricultural regions, 8) Review of the effect of climate on crops and harvest, 9) Forestry in Byelorussia. A map of agroclimatic regions completes the last volume and a good source of references on the climate of Belorussia. *Subject Headings:* **1. Climate of western Russia 2. Climatic data 3. Agricultural climatology 4. Winter climatic elements 5. Thunderstorm dynamics 6. Byelorussia, U.S.S.R.** —*N.A.S., M.R.*

4.3–243 551.582(93)

The climate of the world. 5. Australia and New Zealand. *Weather*, 7(9):279–282, Sept. **1952.** diagrs. **DWB**—Diagrams of monthly temperature, pressure and rainfall at 18 places in Australia, 6 in New Zealand, and Port Moresby (New Guinea), Tulagi (Solomon Is.) and Suva (Fiji). *Subject Headings:* **1. Local climates 2. Australasia 3. New Zealand 4. Pacific Ocean.**—*C.E.P.B.*

4.3–244 551.582:551.588.7(02)(438)

Zych, Stanisław, **Przegląd literatury z zakresu klimatologii miast.** [Review of literature on climatology of cities.] *Przegląd Meteorologiczny i Hydrologiczny*, 1950/1951:227–230, **1951. DWB**—The author reviews some international literature which would be helpful in the projected description of the climate of the most important Polish cities. *Subject Headings:* **1. Meteorological literature 2. Urban climates 3. Poland.**—*Wanda Tomczykowski.*

4.3–245 551.582.1:69(71)

Legget, Robert F., **Climate and building.** National Research Council of Canada, Div. of Building Research, [1951]. 8 p. photos., 9 refs. Reprinted from: *Engineering and Contract Record*, Toronto, Aug. **1951. DWB**—Problems faced by Canadian architects and builders are mainly those which arise from extremes of cold or snow. Test huts were erected at Ottawa, Saskatoon and Churchill to study heat loss and humidity changes with various types of walls. The recent crusade by *House Beautiful* in U.S.A. and other studies made in

America, Australia and South Africa are mentioned. From the start, climate has been one of the major areas of research for the building industry in Canada. Problems of winter construction, spring break-up, snow loads, wind stresses, heating and ventilating, solar heating, heat loss in soil, weathering, wind chill, etc. are discussed. The close working relations of the Division of Building Research with the Meteorological Service of Canada is stressed throughout. It is mentioned that the first punched card data were made on Oct. 17, 1950, in Canada. *Subject Headings:* **1. Climate and building design 2. Applied climatology 3. Punched card applications 4. Climate of Canada 5. Canada. I. National Research Council of Canada. Div. of Building Research.**—*M.R.*

4.3–246 551.582.1:551.577.61(969)

Leopold, Luna Bergere, **Hawaiian climate: its relation to human and plant geography.** *Meteorological Monographs*, Boston, 1(3):1–6, June **1951.** 4 figs. **MH-BH**—Annual rainfall maps are given for the Hawaiian Islands. The influence of rainfall on pineapple and sugarcane cultures is examined. The economic importance of short and long range weather forecasts is emphasized. *Subject Headings:* **1. Climate of Hawaii 2. Rainfall effects 3. Agricultural meteorology 4. Hawaii.**—*A.A.*

4.3–247 551.582.2(676)

*East Africa High Commission. Meteorological Dept., **Collected climatological statistics for East African stations.** Nairobi, [**1950**]. 44 p. mostly tables. Price: Shs 7/50. **DWB**—Temperature, precipitation, humidity, evaporation, cloudiness, wind, sunshine and mean soil temperature data for each month and the year are presented for 65 stations in Kenya, Tanganyika, Uganda, Zanzibar, Pemba and Seychelles for entire period of record (5 to 54 years) for each station. A station location chart and a table giving coordinates and altitudes of stations (in ft, ms and gdm.), and length of record for each element is included. Winds are given in the form of frequencies of specified velocity groups. Extremes and frequencies of extreme temperatures are also given. *Subject Headings:* **1. Climatic summaries 2. Climatic data 3. Long period records 4. East Africa 5. Seychelles.**—*M.R.*

4.3–248 551.582.2:629.13(48)

*Great Britain. Meteorological Office, **Aviation meteorological report on Northern Scandinavia.** *Great Britain. Meteorological Office, Aviation Meteorological Report* [unnumbered], [n.d.] each part renumbered. tables, 4 refs. M.O. Misc., 365. Typescript. **DWB**—A description of the meteorological conditions for each season. Information important for aviation is given about general synoptic situations, temperature conditions, ice formation on aircraft, winds, clouds, precipitation, visibility, freezing of lakes and snowcover. Data are added in appendix. *Subject Headings:* **1. Aviation climatology 2. Climatology 3. Scandinavia.**—*A.A.*

4.3–249 551.583.15:551.582.2(797)

*Peterson, Andrew Delbert (*U. S. Weather Bureau and Utah Univ.*), **Temperature and precipitation trends in Eastern Washington.** 5+p. 7 figs. Photostat of typescript. Note on t-p: Paper to be presented at meeting of American Meteorological Society, Corvallis, Oregon, June 17, **1952. DWB**—The author uses 10-year overlapping means. A rise of over 2°F is found in the annual temperature trends in the 60 years before 1941. The temperature now decreases sharply, especially in summer. The trends of the seasonal temperatures are discussed. The continentality calculated as the difference summer temperature less winter temperature shows a well-expressed trend with minima in the decade before 1903 and 1946 and a maximum between 1925 and 1935, which was connected with less precipitation and frequent droughts during this time. *Subject Headings:* **1. Climatic variations 2. Temperature trends 3. Precipitation trends 4. Washington (state).**—*A.A.*

CLIMATIC CHANGES

4.3–250 551.583:581.056

Rudakov, V. E., **Metod obrabotki godichnykh kolets derev'ev dlia vyiavleniia vliianiia kolebanii klimata na ikh tolshchinu.** [Method of treatment of annual tree rings for explaining the influence of climatic variations on their thickness.] *Akademiia Nauk SSSR, Doklady, Novaia Seriia*, 84(1):169–171, **1952. DLC**—The author presents a method for eliminating nonclimatic influences and the effect of unequal growth of trees upon annual tree rings. This method consists of introducing a correction factor, $M = a/b \times 100$, where a = amount of annual growth obtained by measuring rings, and b = magnitude of calculated running growth for the number of years, included by the formula, relative to the year of formation of the annual ring. The application of this procedure is illustrated and analyzed. *Subject Headings:* **1. Dendrochronology 2. Climatic effects 3. U.S.S.R.**—*I.L.D.*

4.3–251 551.583:581.056

Schulman, Edmund, **Definitive dendrochronologies: a progress report.** *Tree-Ring Bulletin*, 18(2/3):10–18, Oct. 1951/Jan. **1952.** 2 tables, fig., refs. **MH-BH**—In this preliminary report on results of the first half of a three-year program started in April 1950 by the Univ. of Arizona under Navy contract NR 089–020, procedures of determining climatic sensitivity of trees are discussed, sensitivity indexes of various species tabulated and correlation between winter or summer rainfall and the growth of trees determined. Comparative diagrams of tree rings and corresponding river runoff are presented. The effect of recent climatic fluctuations and of human activities on tree rings is discussed. The investigation extends over areas of all major streams in the West, including parts of Canada and Mexico. *Subject Headings:* **1. Climatic effects 2. Dendrochronology 3. Rainfall influences.**—*G.T.*

4.3–252 551.583.14:551.21

Wexler, Harry (*Chief, Sc. Ser. Div. U. S. Weather Bur.*), **Volcanoes and world climate.** *Scientific American*, 186(4):74–80, April **1952.** figs. **DWB**—Various theories attempting to account for changes in the general climate of the earth are reviewed and found lacking. The author examines the hypothesis attributing climatic changes to a decrease in insolation due to obstruction by clouds of ash propelled into the atmosphere in major volcanic explosions. The eruption of Krakatoa (Netherlands Indies) in 1883 and its effect on solar radiation records at Montpelier, France, is cited as an example and the records in question shown on a graph. The warming up of the Northern Hemisphere during the last decades is partly attributed to the lack of volcanic activity, while during the same period both volcanic activity and a general cooling could be noted over the Southern Hemisphere. Without drawing general conclusions the author believes that volcanic explosions, which reduce the amount of solar radiation reaching the earth's surface for as long as 3 years, may have some effect on long-range climatic variations. *Subject Headings:* **1. Climatic trends 2. Volcanic eruptions 3. Krakatoa eruption.**—*G.T.*

4.3–253 551.583.2:551.311.12

Harrington, H. J., **Glacier wasting and retreat in the Southern Alps of New Zealand.** *Journal of Glaciology*, 2(12):140–145, Nov. **1952.** 2 figs., 29 refs. English and German summaries p. 140–141. **DWB**—It is considered that snow line began to rise in Rangitata area about 1866 and rise extended southwards to all Southern Alps by 1913. Ends of glaciers have retreated since 1866 by downwasting. Retreat has been continued for about 200 years with temporary interruptions. Retreat associated with decreased precipitation since 1863 and a southward shift of the South Polar front indicated by change of wind from SW to W. *Subject Headings:* **1. Historical climates 2. Glaciers 3. New Zealand.**—*C.E.P.B.*

4.3–254 551.583.3:551.311.12

Klute, F., **Wie kann das Klima der letzten Eiszeit in Mitteleuropa bestimmt werden?** [How can the climate of Central Europe during the last glacial period be determined?] *Scientia*, Milan, 86(1566):48–55, **1951.** 3 charts. **DWB**—A review made of various methods for determining the climate prevailing in Central Europe during the last glaciation, and the characteristics of the climate deduced. A comparison of the present snow lines with those of

the glacial period, the evidence of permafrost in the region and a comparison of the glacial and present day polar limit of the forest zone provide indication regarding the temperature of the glacial period. The loess deposits and sand dune positions during the glacial period indicate the wind direction. From the temperature and wind direction it is possible to determine the areas of high and low pressure and the paths of cyclones. Mean annual temperature in glacial time is estimated between −2.7° and −5.5°C and mean annual range between 18.4° and 34.1°C. Precipitation was brought by westerly winds, and cyclones moved eastward. The position of the ice sheet, the forest limit and paths of cyclones, summer and winter are illustrated on maps. *Subject Headings:* **1. Climatic changes 2. Glacial periods.**—*I.L.D.*

4.3–255 551.583.3

Guillien, Yves, **Paléoclimatologie charentaise.** [Paleoclimatology of the Charente Valley.] *Annales de Géographie*, 61(324):134–138, Mar./Apr. **1952.** refs. **DWB**—The solifluction deposits on the Charente slopes, disturbed by ice, are attributed to a long post-glacial cold dry period. Arguments against other interpretations are set out. *Subject Headings:* **1. Quaternary climates 2. Charente Valley, France.**—*C.E.P.B.*

4.3–256 551.583.3:529:551.461

Obruchev, S. V., **Khronologiia lednikovykh epokh po probam morskikh gruntov.** [Chronology of the ice ages as determined by samples of sea bottoms.] *Priroda*, Moscow 40(12):40–41, Dec. **1951. MAB**—On the basis of a 15.4 m core sample taken from the bottom of the Caribbean Sea by the Swedish "Albatross" oceanographic expedition and assuming a rate of deposition of foraminifera of 1 cm per 1000 yrs it appears that the duration of the Quaternary age was approximately 1.5 million yrs as compared with the accepted figure of about 1 million yrs. The author suggests that, on the basis of the approximate agreement between variations in the water temperature in the Caribbean and known variations of the Ice Age in North America could provide information on the duration of the Quaternary Age. *Subject Headings:* **1. Glacial periods 2. Ocean floors 3. Chronology 4. Bottom samples 5. Oceanographic expeditions 6. Caribbean Sea.**—*I.L.D.*

4.3–257 551.583.7:539.16

Zviagintsev, O. E., **Radioaktivnost' i teplovoĭ rezhim zemli.** [Radioactivity and heat regime of the earth.] *Priroda*, Moscow, 40(12):44, Dec. **1951. DWB**—At present the solar energy absorbed by the earth amounts to 1.9×10^{18} cal/hr and the energy from radioactive elements amounts to 0.47×10^{18} cal/hr. In past geologic ages the energy derived from radioactive decay was considerably greater and can be calculated by the equation $Q_0 = Q_t \times e\lambda^t$, where Q_t = quantity of heat of radioactive origin t years ago; Q_0 = quantity of heat produced by any radioactive element at present; λ = condition of radioactive decay in cal/hr. Data on quantity of heat in cal/hr produced by radioactive elements at present and in the past are given in a table. *Subject Headings:* **1. Geological climates 2. Radioactivity of the earth.**—*I.L.D.*

MICROCLIMATOLOGY

4.3–258 551.584.2:551.501.3:71

Böer, Wolfgang, **Einige Vorschläge zur praktischen Durchführung einer geländeklimatischen Aufnahme unter besonderer Berücksichtigung städtebaulicher Gesichtspunkte.** [Some proposals for a practical regional climatic survey, especially from the town-planning point of view.] *Angewandte Meteorologie*, 1(7):219–222, Oct. **1952.** 5 refs. **MH-BH**—Author devises a 0–5 scale of climatic suitability, taking account of effect of building on existing local climate, based on development of a cold air pool, temperature mean and variability, radiation (especially UV), windiness, precipitation, fog and atmospheric impurity. *Subject Headings:* **1. Mesoclimatology 2. Town planning.**—*C.E.P.B.*

4.3–259 551.584.3:635

Seitzer, J., **Bodenpflege durch Bodenbedeckung, wirtschaftliche Klimameliorationen und andere Fragen des praktischen Obstbaues.** [Soil care by covering the soil, economical climatic ameliorations and other questions of practical fruit culture.] *Germany. Deutscher*

Wetterdienst in der US-Zone, Berichte, No. 32:42–43, 1952. **DWB**—Changing microclimatic conditions is suggested, by covering the soil with compost. The water need of fruit trees and different underlying crops during the growing period is graphically presented. *Subject Headings:* **1. Microclimate control 2. Fruit culture 3. Evapotranspiration.**—*A.A.*

4.3–260 551.584.4:551.524.4

Benac, P. and Lafargue, C. (*Obs. du Puy-de-Dôme*), **Un problème de microclimatologie. Les inversions de température sur la colline de Cournon.** [A problem of microclimatology. Temperature inversions on Cournon Hill.] *Puy-de-Dôme. Observatoire, Publications, Ser. B*, No. 3, 1952. 7+p. 2 photos., 8 graphs. **DWB**—Four stations were established in 1950 at 370, 386, 425 and 472 m elevation, extending from the base to near the top of Cournon Hill in the vicinity of Puy-de-Dôme. Minimum thermometers were installed at each station at heights of 0.20 and 1.20 m above the ground. During 1951, 5 thermometers were installed at 0.50 m height at 370, 392, 427, 472 and 496 m elevation (the last on the hilltop). The percentage of inversions in the spring of 1950 was high (81–86%, at 1.20 m and 92–100% at 0.20 m in March–May), respectively. Frosts were more frequent in the valley than on the hill. Gradients at all stations are computed and shown graphically. *Subject Headings:* **1. Frost 2. Orographic effects 3. Microclimatology 4. Temperature gradient 5. Cournon Hill, France.**—*M.R.*

4.3–261 551.584.65

Montoriol Pous, Joaquin, **Meteorología hipogea.** [Subterranean meteorology.] *Urania* Barcelona, 36(228):225-246, Oct./Dec. 1951. table, 14 figs., bibliog. **DWB**—This study of the meteorology of the caves of Spain and the Balearic Islands includes water and air temperatures at depths up to 300 m below ground, a discussion of the heat balance and thermal circulation of the air and formation of subterranean fogs by mixing saturated air masses at different temperatures. *Subject Heading:* **1. Cave temperatures.**—*C.E.P.B.*

4.3–262 551.584.7:546.264

Koepf, H., **Bodenklima und Bodenatmung.** [Soil climate and soil respiration.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 32:34–37, 1952. 3 figs., 9 refs. **DWB**—Measurements of the CO_2 production of the soil and its relationship to temperature and moisture content of the soil are examined. CO_2 production is very dependent on meteorological conditions. The optimum temperature for the activity of bacteria is 25°C at a depth of 20 cm; the optimum moisture content is 60–70% of the water capacity of the soil. *Subject Headings:* **1. Soil climatology 2. Soil respiration 3. Carbon dioxide.**—*A.A.*

CLIMATIC CLASSIFICATION

4.3–263 551.585.53

Arid zones. *United Nations Educational, Scientific and Cultural Organization, Courier* 5(7):2–4, July 1952. illus. **DWB**—Activities of a committee in charge of UNESCO's arid zone program initiated at a general conference of UNESCO at Beirut in 1948 are briefly reported. The committee is conducting research in the fields of hydrology, plant ecology and power supply. Technical assistance programs extended by UNESCO to different countries are mentioned. *Subject Headings:* **1. Arid zone research 2. UNESCO Advisory Committee on Arid Zone Research.**—*G.T.*

4.3–264 551.585.53

Distribution of arid climates. *United Nations Educational, Scientific and Cultural Organization, Courier*, 5(7):7–9, July 1952. maps. **DWB**—A world map of arid zones prepared by Dr. Peveril Meigs, chairman of the Arid Zone Committee, International Geographical Union, Washington, is reproduced in a slightly simplified form. "Extreme arid," "arid" and "semi-arid" zones are distinguished on the map and definitions of these terms given. The usefulness of such a map and some features of the distribution of arid climates are discussed. *Subject Headings:* **1. Desert climates. I. Meigs, Peveril.**—*G.T.*

4.3–265 551.585.55

Dokuchaev, V. V., **Nashi stepi prezhde i teper'.** [Our steppes before and now.] (In: Akademiia Nauk SSSR. Institut Fiziologii Rastenïi im. K. A. Timiriazeva, **Klassiki russkoĭ agronomii v bor'be s zasukhoĭ.** [Classics of Russian agronomy in their fight against drought.] Moscow, **1951.** p. 11–109. figs., tables, refs.) **DLC**—The contents of this monograph were published in 1892 in "Pravitel'stvennyĭ Vestnik." A French summary "Les steppes russes autrefois et ajourdhuis" appeared in "Congrès International d'Archéologie Préhistorque et d'anthropologie, Séssion II-ème à Moscou du 1/13–8/20 aôut 1892," T.I.M., Imp. de l'Université, 1892, p. 187–240; and an English summary "The Russian steppes," was published by the Department of Agriculture. Ministry of Crown Domains for the World's Columbian exposition at Chicago, Crawford, 1893. 61 p. The individual chapters are as follows: "The geology of Russia in general and in that of southern steppes in particular"; "The surface structure and waters of our steppes"; "The soils of the steppes; chernosem, forest soils, salt soils, etc."; "Vegetation of the steppes"; "Fauna of the steppes" and "Climate of the steppes." *Subject Headings:* **1. Steppes 2. U.S.S.R.**—*I.L.D.*

4.3–266 551.585.55:551.588.1

Izmail'skiĭ, A. A., **Kak vysokhla nasha step'.** [How our steppe became arid.] (In: Akademiia Nauk SSSR. Institut Fiziologii Rastenïi im. K. A. Timiriazeva, **Klassiki russkoĭ agronomii v bor'be s zasukhoĭ,** [Classics of Russian agronomy in their fight against drought.] Moscow, **1951.** p. 111–169. 8 tables, 2 graphs.) **DLC**—This study which was published apparently in the latter half of 1890's is based largely upon observations made in the Kherson Region. It contains the following chapters: "Some characteristics of chernozem soils during different degrees of soil humidity"; "The growth of wheat in soil with varying degrees of humidity"; "The drying out of the tillage layer; comparative humidity of soil as influenced by their state of cultivation"; "The geological structure of the area investigated; the depth of ground, ground water and its upper level; gradient of the soil from surface to ground water"; "The dependence of the upper level of ground water upon local relief and local accumulation of precipitation"; "Previous and present steppes; then comparative importance in the accumulation of soil moisture" and "Measures for overcoming the impoverishment of soil moisture." *Subject Headings:* **1. Steppes 2. Aridity 3. Soil moisture 4. U.S.S.R.**—*I.L.D.*

4.3–267 551.585.55:001

Wagner, Heinrich (*Vienna*), **Zur Klärung des Steppenbegriffes.** [Clarification of the concept "steppe."] *Wetter und Leben*, 4(1/2):15–17, Feb. **1952. MH-BH**—The narrow definition of "steppe" is based upon climatic characteristics, such as large annual and daily temperature variations, low and variable precipitation hindering the growth of trees. The concept "steppe" has wider connotations in botanical usage, being applied to grain fields, moors, etc.; also the term "salt steppe" is used. Soil scientists attempt to limit "steppe" purely to black earth steppe regions. The author contends that a wider aspect of the concept "steppe" be used so as to indicate interaction of climate, soil and vegetation. *Subject Headings:* **1. Steppes 2. Definitions.**—*I.L.D.*

BIOCLIMATOLOGY

See also: **Cooling and dehumidifying equipment** (Ramsey), 4.3–29; **Rate of cooling measurements with katathermometers** (Koch), 4.3–65; **UV radiation, cause of injury to peach** (de Villiers), 4.3–138; **Solar effect, protection** (Ellerbroek), 4.3–140; **Climate of Byelorussia, U.S.S.R.** (Kaĭgorodov), 4.3–242.

4.3–268 551.586

Sauberer, F., **Kleinklimatische und bioklimatische Arbeiten an der Biologischen Station Lunz.** [Microclimatological and bioclimatological work at the Lunz Biological Station.] *Wetter und Leben, Sonderheft*, No. 1:4–12, May **1952.** 17 refs. **MH-BH**—A brief history of the biological station since its founding in 1906 and a detailed summary of the ecological, bioclimatological investigations carried out at the Lunz Biological Station are presented. The first microclimatic network was established here in 1927 by EXNER and microclimatic in-

vestigations were carried out in winter and summer of subsequent years. W. SCHMIDT began microclimatic studies at Lunz. Studies on the evaporation in small spaces, on radiation climate of forests and tree stands, meteorological and oceanographic studies in connection with the German Limnological Sunda Expeditions and numerous other biological and bioclimatic investigations were carried out under the auspices of the Lunz Station or at the station itself. *Subject Headings:* **1. Microclimatological research 2. Bioclimatic research 3. Lunz Biological Station 4. Austria.**—*I.L.D.*

4.3–269 551.586:63:58:551.582.1(477)

*Nuttonson, Michael Y., **Ecological crop geography of the Ukraine and the Ukranian agro-climatic analogues in North America.** *International Agro-climatological Series, Study*, Wash., D. C., No. 1, **1947.** 24 p. tables, bibliog. **DLC**—The geography and climate of the Ukraine is discussed and North American analogs found. Main plant species growing in the mixed forest belt, in the forest grassland belt and in the steppe belt are listed. A table containing data on mean monthly temperature, relative humidity and precipitation, on absolute temperature, on average killing frost dates, duration of average frostless periods and on precipitation effectivity indices is presented for 66 meteorological stations. The location of the stations is shown on a chart with indication of altitude and references to North American climatic analogs. *Subject Headings:* **1. Agricultural climatology 2. Ecoclimatology 3. Climatic analogs 4. Climatic data 5. Climate of the Ukraine 6. Ukraine, U.S.S.R. I. American Institute of Crop Ecology, Washington, D. C.**—*G.T.*

4.3–270 551.586:63

von Poletika, W., **Agrarklimatische Synthese der russischen Landwirtschaft.** [Agricultural climatic synthesis of Russian agriculture.] *Germany. Deutscher Wetterdienst in der US Zone, Berichte*, No. 38:249–254, **1952.** 2 figs., table, 3 refs. **DWB**—The potential fruitfulness of the Black Earth region is limited by lack of water and in Asia by salting up. Drought periods and hot dry winds cause great fluctuations in yield. Erosion is severe. *Subject Headings:* **1. Agricultural meteorology 2. Soils 3. U.S.S.R.**—*C.E.P.B.*

4.3–271 551.586:631

Zanon, Francesco Saverio, **Bioclima di Venezia: un ventennio di richerche fenologiche.** [Bioclimate of Venezia: twenty years of phenological research.] *Geofisica Pura e Applicata*, 22(1/2):97–107, Jan./March **1952.** fig., 2 tables, 3 refs. Italian and English summaries p. 97. **MH-BH**—On the basis of seven years of observations the author confirms the previous finding that English Yew (*Taxus baccata*) flowers only when the minimum air temperature is close to 5°C during the immediate days preceding flowering. On the basis of 20 years of record the author analyzes the flowering data of pomegranate (*Punica Granatum*); critical temperature of 5°C is necessary. The various meteorological factors determining the time of flowering such as minimum air temperature, air humidity and amount of rainfall preceding flowering and solar radiation are examined. *Subject Headings:* **1. Phenological data 2. Meteorological influences 3. Venezia, Italy.**—*I.L.D.*

4.3–272 551.586:631.4:551.482

Johnson, E. A., **Effect of farm woodland grazing on watershed values in the Southern Appalachian Mountains.** *Journal of Forestry*, Wash., D. C., 50(2):109–113, Feb. **1952.** 6 figs., table. **DLC**—Grazing effects on vegetation and trampling effects on physical properties of the soil are discussed on the basis of watershed experiments made from 1941 to 1948 after a 4-year standardization period. The soil porosity was decreased up to 60%, the permeability and infiltration rate up to 90%, the stream turbidity due to erosion increased from 30 parts per million to over 100 parts per million. The same 4 in. of rainfall produced 4–25 times greater peak discharges after grazing than before. *Subject Headings:* **1. Grazing effects 2. Soil porosity 3. Watersheds.**—*A.A.*

4.3–273 551.586:633(497.1)

Radojević, Rad. (*Skoplje*), **O klimatskom reoniranju naše proizvodnje duvana.** [On climatic regions for tobacco cultivation.] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik*, 3:64–71, **1950.** In Serbian. **DWB**—Four main regions of tobacco

culture in Yugoslavia are outlined on a climatic basis. The most important area is the Macedonia region which has a warm and dry climate and good soil conditions where the best types of oriental tobacco are cultivated. The Herzegovina region produces other kinds of tobacco which grow in a warm maritime climate. In the valley regions of Drina and Morava with continental climate and short growing season the early ripening tobacco is being grown, containing an increased amount of nicotine. In the Pannonia with its Middle European climate the European types of tobacco are cultivated, however this province has also its own varieties as the "Tisza," "Segedinska ruza" and "Sabolci." *Subject Headings:* **1. Climatic regions 2. Tobacco cultivation 3. Yugoslavia.**—*N.T.Z.*

4.3–274 551.586:634(6)

de Villiers, G. D. B. (*Dept. Agri. South Africa*), **Climatology in relation to land use with special reference to the influence of climate on fruit growing.** (In: African Regional Scientific Conference, Johannesburg, Oct. 17–28, 1949, 2:37–41, **1950.** In English, French summary p. 41.) **DWB** A general discussion of the importance of climatology to future agricultural settlement in Africa and climatology and crop production, in particular fruit growing, namely tropical fruits and nuts, sub-tropical fruits and hardy or deciduous fruits. The author gives a somewhat detailed description of the research in fruit production that is being carried out in the Union of South Africa and surveys the possibilities for fruit growing in the tropical lowlands and in the tropical highlands and the facilities for cooperative research on fruit growing in Africa. *Subject Headings:* **1. Agricultural climatology 2. Fruit culture 3. Africa.**—*I.L.D.*

4.3–275 551.586:634 551.582(624) 551.577.21(624):551.579.5

Smith, J., **Distribution of tree species in the Sudan in relation to rainfall and soil texture.** *Anglo-Egyptian Sudan. Ministry of Agriculture, Bulletin*, No. 4, **1949.** 68 p. 17 plates, 45 refs. **GB-MO**—Pt. 1 deals with the geography and climate of the Anglo-Egyptian Sudan, including rainfall, with mean annual isohyets (25–1500 mm), temperature, winds (including duststorms and "dust bowl" conditions) and humidity. Remaining sections deal with forest geography and soils, including relations to rainfall, estimation of rainfall from natural occurrence of species, and rainfall-runoff-evaporation relations. *Subject Headings:* **1. Precipitation charts 2. Climatic surveys 3. Forests 4. Soil types 5. Anglo-Egyptian Sudan.**—*C.E.P.B.*

4.3–276 551.586:634

Voeĭkov, A. I., **Otdel'nye glavy iz izbrannykh sochineniĭ po voprosam klimatologii.** [Separate chapters from selected works on the problems of climatology.] (In: Akademiia Nauk SSSR. Institut Fiziologii Rasteniĭ im. K. A. Timeriazeva, **Klassiki russkoĭ agronomii v bor'be s zasukhoĭ.** [Classics of Russian agronomy in their fight against drought.] Moscow, **1951.** p. 285–324. tables.) **DLC**—These two chapters, taken from the selected writings of A. I. Voeĭkov (*see item* 3.4–4, April 1952, *MAB*) published by the Akademiia Nauk SSSR, 1948, are Chapt. 19: "Influence of climate upon vegetation" and Chapt. 20: "Influence of vegetation in particular forests upon climate." The latter contains temperature data for the interior of forests and simultaneous temperature outside forests. *Subject Headings:* **1. Forest climatology 2. Vegetation influences 3. U.S.S.R.**—*I.L.D.*

4.3–277 551.586:634.9:551.577.38

Jedlovski, D. (*Split*), **Meteorološka opažanja pri primjeni suhih kultura u šumskim rasadnicima.** [Meteorological observations in a forest nursery during drought conditions.] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik*, 3:60–63, **1950.** fig. In Croatian. **DWB**—Preliminary results of experiments conducted at the Institute for Afforestation and Soil Improvement at Split are reported. It is pointed out that seedlings planted and grown under favorable conditions fail to resist drought when finally transplanted into natural conditions. Better results are obtained if plants are conditioned by limiting them from the very beginning to moisture naturally found in the soil. Experiments were made with seedlings planted in elevated beds and in beds 10 cm below ground surface, and data on soil temperature, air temperature, humidity and the growth of plants obtained in the two cases are compared. *Subject Headings:* **1. Forest nurseries 2. Forest soil moisture 3. Drought.**—*G.T.*

4.3–278 551.586:634.956.22

Müller, W. L., **Über die Witterungsabhängigkeit von Samenerträgen bei Buchen und Eichen.** [On the dependence of the seed yield of beeches and oaks on the weather.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:240–244, **1952.** 4 figs., 3 tables, 7 refs. **DWB**—From a forest chronicle since 1685 the seed yields of beech and oak are tabulated on a scale of 0–3, and related to weather. The belief that a severe winter follows a rich crop was not verified. Clear periodicities of 8 and 11 years were found. *Subject Headings:* **1. Bioclimatology 2. Forests.**—*C.E.P.B.*

ENVIRONMENTAL INFLUENCES

See also: **Agricultural meteorology** (Schwenkel), 4.3–24; **Steaming forests** (Rossmann), 4.3–204; **Wooded watershed, Michigan** (Smith and Crabbe), 4.3–235; **Climatology of cities** (Zych), 4.3–244; **How steppe became arid** (Izmail'skiĭ), 4.3–266.

4.3–279 551.588.1:551.526.6:551.465

Groen, P., **Over de golfstrom en ons klimaat.** [The Gulf Stream and our climate.] *Hemel en Dampkring*, 50(1):3–5, **1952. DLC**—A brief and simple description of the course of the Gulf Stream (illustrated by a map), of its motive force, of its effect upon the climate of Labrador, Greenland and western Europe, in particular that of Holland. The possible effect of an increase in warm water transported by the Gulf Stream upon the climate of western Europe and the possibility of a change in the course of the Gulf Stream are discussed. *Subject Headings:* **1. Gulf Stream effects 2. Netherlands.**—*I.L.D.*

4.3–280 551.588.6(59)

Carton, P. and Sallenave, P., **Considérations sur l'action réciproque des fôrets et du climat.** [Interaction of forest and climate.] *French Indochina. Bulletin Économique de l'Indochine*, 41:293–319, **1938.** 5 photos. Photostat. **DWB**—Works of the past century (Hann, Klein, Sanson, Braak and others) on influence of vegetation on rainfall, are reviewed and application of ideas to conditions in Indochina cited. It is concluded that forests are valuable in themselves, they protect soil and soil moisture, humidity and the microclimate in the immediate vicinity, and have little effect on the climate as a whole or on rainfall; they do affect ceiling height, turbulence, visibility and fog. Microclimatic data obtained in and outside of a forested area for the years 1933–37, are tabulated, showing the difference. The effect of climate on vegetation, and of vegetation on soil and on runoff is also considered in detail. *Subject Headings:* **1. Forest influences 2. Microclimatology 3. Indochina.**—*M.R.*

4.3–281 551.588.6:06

Zebranie Pol. Tow. Geograficznego oraz Pol. Tow. Meteorol. i Hydrol. w Warzawie. [Report on a joint session of the Polish Geographical Society and the Polish Meteorological and Hydrological Society.] *Gazeta Obserwatora PIHM*, Warsaw, 3(12):14–15, Dec. **1950. DLC**—A report "Forest as a climatic factor," delivered by Dr. Gumiński is reviewed in this article. *Subject Headings:* **1. Forest influences 2. Conferences 3. Poland. I. Gumiński, Romuald.**—*A.M.P.*

4.3–282 551.588.7:551.585.5(47)

Gerasimov, I. P., **Preobrazovanie prirody stepeĭ i pustyn'.** [Transformation of nature in steppes and deserts.] *Priroda*, Moscow, 41(1):25–39, Jan. **1952.** 12 figs., 8 refs. **DLC**—A popular account of various programs for improving the microclimate and the water economy of the steppes and deserts of the Soviet Union and of the most important problems arising in the execution of the various programs. *Subject Headings:* **1. Climatic amelioration 2. Water resources 3. Steppes 4. Deserts 5. U.S.S.R.**—*A.A.*

SYNOPTIC CLIMATOLOGY

See also: **Icing, SW Indian Ocean** (Emon), 4.3–197.

4.3–283 551.589.5 551.515.8

Frisby, E. M. and Green, Frederick H. W., **Further notes on comparative regional climatology.** *Institute of British Geographers, Transactions*, **1949.** p. 143–151. 7 figs., refs. Abstracted from reprint. **GB-MO**—Continuation of: GREEN, F. H. W., "A few notes on the presentation of regional climatology," *Ibid.*, Jan. 1947. It is suggested that specific climatic interpretations should be based on air mass study. Examples given for the British Isles include cloud type and precipitation in Northern Maritime air (summer), Arctic maritime (winter and summer) and histograms of annual variation of various air masses. The characteristic features of each are discussed. *Subject Heading:* **1. Air mass characteristics.**—*C.E.P.B.*

MISCELLANEOUS APPLICATIONS

COSMIC INFLUENCES

4.3–284 551.590.21:523.7

Waldmeier, M., **Die Sonnenaktivität im Jahre 1949.** [Solar activity in 1949.] *Naturforschenden Gesellschaft in Zürich, Vierteljahrsschrift*, 95(3):212–224, Sept. 30, **1950.** 2 figs., 9 tables. English summary p. 212. **DWB**—Statistical data on sunspots, photospheric faculae, prominences and the coronal line 5305 Å are presented in terms of intensity, frequency and areal distribution. They represent results obtained in measurements by the Zurich, Locarno-Monti and Arosa Observatories corrected and completed with data obtained from stations in Europe, the U. S., New Zealand and Japan. *Subject Headings:* **1. Solar phenomena 2. Sunspots 3. Switzerland.**—*G.T.*

4.3–285 551.590.25(492)

Van Diggelen, J., **Het vreemde lichtverschijnsel van 12 Februari 1951.** [Unusual optical phenomenon of Feb. 12, 1951.] *Hemel en Dampkring*, 50(2):25–32, **1952.** 4 figs. **MH-BH**—On the basis of individual observers' reports of a meteorite seen over Holland on Feb. 12, 1951 the author demonstrates the determination of the height, path and size of the meteorite, discusses the evidence indicating that it was a stone meteorite and analyzes, on the basis of atmospheric temperature and wind direction, the course of the sound waves associated with the reported explosion. *Subject Headings:* **1. Meteorites 2. Optical phenomena 3. Netherlands.**—*I.L.D.*

VISIBILITY

See also: **Bulletin of Fabra Observatory, Spain,** 4.3–38; **Cloudiness in choice of astronomical sites** (Hess), 4.3–197.

4.3–286 551.591:535.7

Peckham, R. H. and Arner, W. J., **Visual acuity, contrast, and flicker, as measures of retinal sensibility.** *Optical Society of America, Journal*, 42(9):621–625, Sept. **1952.** 6 figs., 8 refs., 3 eqs. **DWB**—Visual acuity at three contrasts and two brightnesses, and critical flicker frequency (CFF) at two brightnesses, were measured morning and evening on 24 subjects for five successive days. During the days the subjects drove automobiles for several hours, in the brilliant sunshine of the Arizona desert. Statistical analysis of the results shows that the acuity and flicker measurements have high correlation, but that the inherent variance of visual acuity measurement is great, while that of CFF is small. The CFF can be used to develop a logarithmic index of retinal sensitivity. Application of this index to the effect of exposure to sunlight is exemplified. Other applications are suggested. *Subject Headings:* **1. Visual acuity 2. Contrast threshold 3. Visibility.**—*Authors' abstract.*

OPTICAL PHENOMENA

4.3–287 551.593.12

Ellison, M. A. and Seddon, H., **Some experiments on the scintillation of stars and planets.** *Royal Astronomical Society, Monthly Notices*, 112(1):73–87, **1952.** 9 figs., table, 12 refs. **DWB**—An exact study of intensity variations of scintillating starlight has been made for a year with a multiplier photocell and cathode ray oscillograph. The set up and its effect on the results are described: the results show that the average true size of the atmospheric irregularities causing scintillation is about 3 inches, at a mean distance of 5.2 km. There is little difference between amplitude of scintillation in white and monochromatic light. As a result of experiments in water it is suggested that refractional irregularities may contribute largely to scintillation, especially at low altitudes. *Subject Heading:* **1. Scintillation.**—*C.E.P.B.*

4.3–288 551.593.13(9)

Smiley, Charles H., **Atmospheric refraction at low angular altitudes in the polar regions.** *Navigation*, Los Angeles, 3(3):81–84, March **1952.** fig., 2 tables. **DWB**—Two tables giving corrections on account of refraction to observed altitudes 10° to 1° for stars and planets (air temperature 0°F and −30°F, respectively) and two tables giving correction on account of refraction and semi-diameter correction to observed altitudes of the lower limb of the sun are presented. The tables are based upon measurements made between 1947 and 1951 at high northern and southern latitudes by various observers including the author. For details regarding observation techniques and mathematical reductions the reader is referred to two previous papers published by the author in *Navigation*, March 1950 and Sept.–Dec. 1951. *Subject Headings:* **1. Atmospheric refraction 2. Refraction phenomena 3. Polar regions.**—*G.T.*

4.3–289 551.593.55:551.576.2

Malsch, Wolfgang, **Der Einfluss der Bewölkung auf den Beginn der Dämmerung.** [The influence of cloudiness on the beginning of twilight.] *Meteorologische Rundschau*, 5(5–6):95–96, May–June **1952.** 2 figs., table, 2 refs. **MH-BH**—A number of observers in Germany timed beginning of twilight in morning and end in evening (defined by legibility of print) and noted cloud conditions. Results compared with times when sun was 6° below horizon. Different observers showed a range of values but all showed a shortening of twilight with increasing cloud, up to 16 min with rain. *Subject Headings:* **1. Twilight 2. Cloud effects.**—*C.E.P.B.*

AURORAS AND OTHER ELECTRICAL PHENOMENA

See also: **Lightning discharge** (Hagenguth), 4.3–6; **Aurorae** (Harang), 4.3–7; **Radio meteorological investigation, South Island of New Zealand,** 4.3–11; **New apparatus recording electric field of atmos.** (Accardi), 4.3–60; **Simple universal apparatus for measuring atmos. electricity** (Reiter), 4.3–63; **Measuring atmos. electric field with radioactive potential sondes** (Wichmann), 4.3–64; **Effects of temp. variations of upper atmos. on formation of ionospheric layers** (Lepechinsky), 4.3–102

4.3–290 551.594.5:551.510.535

Takesi, Nagata, **A reply to the comment by Prof. Ferraro on my article "Southward shifting of the auroral zone."** *Journal of Geophysical Research*, 56(2):292–294, June 1951. table. **MH-BH**—Difference between author's and CHAPMAN-FERRARO views (*see item* 2.5–202, May 1951, *MAB*) lies in magnitude of radius of equatorial ring current. Author assumes in his theory of origin of auroral zone that the "charged particles which impinge on the auroral zone come from around the two points on the front surface of the Chapman-Ferraro stream at which the retardation of propagation of the front becomes zero." Table shows magnetic co-latitude of the outer boundary of the auroral zone assuming Ca– velocity of 1000+2000 km/sec for both a uniform and ring current field. *Subject Headings:* **1. Auroral theories 2. Ionospheric currents. I. Ferraro, V. C. A. II. Chapman, Sydney.**—*M.R.*

4.3–291 551.594.51:550.385

Dungey, J. W., **Theories of magnetic storms and aurorae.** *Nature*, London, 170(4332):795, Nov. 8, **1952.** 6 refs. **DWB**—In opposition to the theories of ALFVEN and MARTYN, author finds that charged auroral particles in a solar magnetic field are accelerated only at neutral points. *Subject Headings:* **1. Auroras 2. Magnetic storms.**—*C.E.P.B.*

4.3–292 551.594.51:535.338.1

Meinel, A. B. and Fan, C. Y., **Laboratory reproduction of auroral emission by proton bombardment.** *Astrophysical Journal*, Chicago, 115(2):330–331, March 1952. fig. **DLC**—Describes an experiment using protons from the Kevatron at the Institute for Nuclear Studies, University of Chicago, to determine the part played by the protons in exciting the auroral emissions. Photos show spectrum emitted by the air under proton bombardment and spectrum of the aurora borealis. The authors point out similarities and differences between the laboratory spectrum and the auroral spectrum, but state that the similarities do not conclusively indicate that protons offer a more satisfactory explanation of auroras than electronic excitation does. More adequate tests using electrons are necessary. *Subject Headings:* **1. Auroral emission 2. Protons.**—*M.L.R.*

SFERICS

4.3–293 551.594.6

§Kimpara, Atsushi and Inagaki, Takeo (*Nagoya Univ.*), **Origin of atmospherics in the Far East.** *Nagoya. University. Faculty of Engineering, Memoirs*, 2(2):66–73, Oct. 1950. 8 figs., 8 refs. Abstracted from reprint. **DWB**—A network of ten stations operating from Oct. 1943 to Dec. 1944 over Japan and the Pacific Islands for the purpose of locating origins of atmospherics is described and shown on a map. Equipment and direction finding methods are discussed. Results obtained in locating sources of sferics are summed up and the seasonal distribution of such sources is shown in charts. Weather conditions from which migratory sferics originate are described and charts of two synoptic situations over the Far East and corresponding directional distribution of sferics in Tokyo presented. The effect of power lines and other ground conditions on the accuracy of direction finding equipment is specified in an appendix. *Subject Headings:* **1. Sferics 2. Far East.**—*G.T.*

4.3–294 551.594.7:551.501.83

Hoff, Robert S. and Johnson, Raymond C., **A statistical approach to the measurement of atmospheric noise.** *Institute of Radio Engineers, Proceedings*, 40(2):185–187, Feb., 1952. 3 figs., 8 refs., 3 eqs. **DLC**—A statistical method that shows promise of improving the accuracy of noise description and measurements. The measuring apparatus is shown in a diagram. The results obtained by this method are compared with the commonly used methods and the data obtained at low frequencies are discussed. *Subject Headings:* **1. Sferics measurement 2. Sferics instruments.**—*W. N.*

ACOUSTICAL PHENOMENA

See also: **Sound propagation in atmos.** (Gutenberg), 4.3–5.

4.3–295 551.596.1

aufm Kampe, Hans Joachim, **Ergebnisse der Schallmessung Helgoland.** [Results of acoustic measurement at Helgoland.] *Meteorologische Rundschau*, 5(5/6):99–105, May/June, 1952. 12 figs., 2 tables, 3 eqs. **MH-BH**—On April 18, 1947, 6000 tons of explosive were set off at Helgoland; normal and anomalous waves recorded at German stations are charted up to a distance of 440 km. Results are discussed in the light of upper winds and temperatures and the weather situation, and the paths of anomalous waves plotted, with some alternative solutions. Above tropopause at 10 km a rise of temperature is determined, to a value of nearly 50°C at 50 km. *Subject Headings:* **1. Explosion waves 2. Helgoland explosion.**—*C.E.P.B.*

4.3–296 551.596.5

Taljaard, J. J., **How far can thunder be heard?** *South Africa. Weather Bureau, News Letter*, No. 35:4, Feb. 29, 1952. Also: *Weather*, 7(8):245–246, Aug. 1952. **DWB**—Thunder has been reported from sources 50–60 miles distant (Germany) though usually 10 miles is considered extreme distance it is likely to be heard. Anomalous propagation might account for greater distances such as in the present instance. The author heard thunder estimated to come from a source 60 to 70 miles (or more) distant, while visiting the Karroo district of South Africa on Feb. 7, 1952 (11:30–12:00h). Showers were reported at 11:30 at Witputs 67 miles from observer. Base of clouds could not be seen with flat horizon and 3600 ft cloud base (estimated from dry and wet bulb) would be >73 miles. *Subject Headings:* **1. Audibility of thunder 2. Acoustical propagation.**—*M.R.*

PART II. SELECTIVE ANNOTATED BIBLIOGRAPHY ON FROST AND FROST FORECASTING

By: *Nikolay T. Zikeev*

EXPLANATORY NOTE

This bibliography contains a representative sample of available material from all parts of the world on frost and frost forecasting, subjects of vital interest to meteorologists, farmers and fruit growers. The bulk of the material deals with the various local, seasonal and synoptic conditions conducive to frost formation; methods of frost forecasting; frost damage to crops, orchards and forests, and means of frost prevention and plant protection. Numerous items on frost frequency, intensity and duration have also been included.

Some material has been chosen for historic interest (e.g., 4C–1 and 4C–2) or as basic information on certain physical processes involved in frost formation (e.g., 4C–222 and 4C–346) or frost effects on soil (e.g., 4C–68, 4C–87, 4C–345). For a more representative bibliography on frost in the soil *see* **Selective Annotated Bibliography on Soil Temperature** in March 1951, *MAB*. For selected material on objective methods of frost forecasting, see **Bibliography on Objective Forecasting** in the May 1952 issue of *MAB*, and for a comprehensive bibliography on frost deposits or hoar frost *see* **Annotated Bibliography on Glaze and Rime at the Earth's Surface** in October 1952, *MAB*.

We call the reader's attention to several bibliographies (4C–13, 4C–77 and 4C–265) where additional material will be found. Previously published items dealing with the subject but not included in the present bibliography are: 2.7–50, 2E–140 (Turkey), 2E–237 (Turkey), 3.9–125, 3.9–130, 3.9–131, 3.10–273, 3.11–142, 3A–159, 3C–69 (Paraguay), 3C–109 (Uruguay), 3C–218 (Uruguay), 3D–41, 3E–129, 4.3–151 and 4.3–260.

The material in the bibliography is arranged chronologically and alphabetically (by author) within each year. A good source of data is indicated by an asterisk (*). The dagger (†) is used to note the fact that a particular item contains a good list of references.

The Outline of Contents will give the user a general perspective of the range of subject matter contained in this bibliography, and should serve also in the location of specific items on specialized subjects or aspects of this general area of scientific investigation. Articles containing data or information on specific localities in various parts of the earth may be located readily by consulting the Geographical Outline which follows the Outline of Contents.

Obviously hundreds of papers on this subject have *not* been included. It is hoped, however, that this Bibliography will serve as a starting point for anyone wishing to compile an exhaustive bibliography on frost forecasting or to get a quick perspective of the work done in several countries along this line.

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BIBLIOGRAPHY ON FROST AND FROST FORECASTING

1684

4C–1 551.524.37:632.1

Evelyn, John, **Abstract of a letter from John Evelyn, Esq., concerning the damage done to his ardens by the preceding winter.** *Royal Society of London, Philosophical Transactions*, 14(158):559, 684. Unchecked. Also in: *Royal Society of London, Philosophical Transactions, Abridged* v. (1683–1694):28–30, **1809. DWB**—An account of the damage done in England to various species f timber and shade trees, shrubs, herbs and garden plants by this, the most prolonged, severe vinter of the century. Holly and other hedge plants were universally killed, as were many exotics. Less damage was done where plants were covered by snow. *Subject Headings:* **1. Frost damage . Great freeze—1683–4 3. Horticulture 4. England.**—*M.R.*

4C–2 551.524.37:632.1

Bobart, Jacob, **On the effects of the great frost on trees and other plants, Anno 1683.** *Royal Society of London, Philosophical Transactions*, 14(165):766, **1684.** Unchecked. Also in: *Royal Society of London, Philosophical Transactions, Abridged* v. 3(1683–1694):89–91, **1809. DWB**—Further accounts of the effect of the prolonged freeze of 1683–1684 on trees, shrubs and gardens. Many trees were split lengthwise, or branches killed. The author suggests covering shrubs and garden plants with straw to prevent damage from frost, and remarks on the "surprising" fact of a old snow cover preventing damage from cold. *Subject Headings:* **1. Frost damage 2. Great freeze—683–4 3. Horticulture 4. England.**—*M.R.*

1709

4C–3 551.555.6

Derham, W., **An account of the great frost in the winter of 1708 and 1709.** *Royal Society of London, Philosophical Transactions*, 26(324):454–458, **1709.** Unchecked. Also: *Royal Society of London, Philosophical Transactions, Abridged* v. 5:533–537, **1809. DWB**—A fascinating account of onditions in England, France, Switzerland, Italy, Germany and Low Countries during the winter f 1708–9, which was stated to be the most severe, if not the most universal within the memory of nan (the *longest* severe winter was 1683). The thermometer readings on several occasions are ompared with readings made during other cold winters, and with calibrations made with salt-ice ixtures. The damage done to orchards and shade trees, gardens, shrubs, etc. was irreparable nd untold human suffering and economic damage was experienced even in Italy. The writer had orrespondence with learned men in many countries and was able to conclude that the shift in inds from E to S or W reached Denmark 1 or 2 days after it did England, that the winds would be ne same in England as on the continent when strong or stormy, but not when weak, and that the rost was, strangely not unusually severe in the northern and western parts of the British Isles. n the continent fish, birds and cattle froze to death. In Italy lemon, orange and many olive trees ere destroyed. On sunny exposures damage was greater than on shady, since snow melted earlier nd did not protect the plants. *Subject Headings:* **1. Cold waves 2. Severe winters 3. Frost amage 4. Western Europe.**—*M.R.*

1807

4C–4 551.524.37(471.1)

Hällström, C., **Om nattfroster i Finnland 1804.** [On night frosts in Finnland in 1804.] (*K.*) *innske Hushallningssällskap, Åbo, Handlingar*, 2:75, **1807.**—Unchecked. *Subject Headings:* **1. Nocturnal frosts 2. Finland.**

1821

4C–5 551.524.37(42)

***Peignot, Gabriel, **Essai chronologique sur les hivers les plus rigoureux, depuis 396 ans av. J. C., usqu'en 1820 inclusivement; suivi de quelques recherches sur les effets les plus singuliers de la oudre, dequis 1676, jusqu'en 1821.** [Chronological account of the most severe winters from 396 .C. to 1820, inclusive; followed by research on the most remarkable effects of lightning from 1676 o 1821.] Paris, Dijon, **1821.** 240 p. tables. **DLC**—In this monograph the author begins with a iscussion of meteorological causes of severe winters including the physics of freezing and ice formation and then gives a chronology of severe winters from antiquity up until 1820 inclusive; for the 7th, 18th and early 19th centuries most of the observations refer to France. The effect of the evere frosts upon human beings and animals, the damage to food supplies and human activities is iscussed. Also an attempt is made at finding a periodicity in the occurrence of severe winters and forecasting them. Also unusually mild winters are cited. Temperature data since 1709 are iven in tables. *Subject Headings:* **1. Severe winters 2. Frost damage 3. Chronology.**—*I.L.D.*

1854

4C–6 551.524.37:551.582(515)

Strachey, Henry, **Physical geography of western Tibet.** London, William Clowes, **1854.** 69 p. fold. map. **DLC**—After a detailed description of physiography, glaciers, floods and break-up of ice in spring, the author gives a remarkably vivid description of the various climatic factors he encountered during 2 years in and around the town of Leh which is on the upper reaches of the Indus. Based in villages at high elevations (10–15,000 ft) and making a score of crossings of the even higher passes through the ranges (17–20,000 ft), he made continual measurements of pressure, temperature of air in sun and shade, earth temperatures in borings, observed winds, clouds, rainfall, snow, snow line, lightning, etc. He found frost every night in winter and temperatures from 35–70° in summer at 12,000 ft while at 15,000 ft or above, frost occurs every night. In summer, thawing occurs up to 20,000 ft in the day time. (*Same as* 2F–193, June 1951, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Climate of Tibet 3. Indus Valley 4. Tibet.**—*M.R.*

1883

4C–7 551.524.37(4)

von Bezold, Wilhelm, **Die Kälterückfälle in Mai.** [Cold waves in May.] (*K.*) *Akademie der Wissenschaften, Munich, Math.-Physik. Klasse, Abhandlungen,* 14(2):69–107, **1883.** map, tables, refs. **DLC**—A report on investigations of May night frosts in western Europe during the last two centuries, and especially in the period 1879–1882. *Subject Headings:* **1. Nocturnal frosts 2. May frosts 3. Long period records 4. Western Europe.**

1884

4C–8 551.509.532

Lang, C., **Welche Zuverlässigkeit besitzt die abendliche Thaupunkt-Bestimmung als Anhaltspunkt für Stellung der Nachtfrost-Prognose?** [How reliable is the evening dew point determination as a basis for night frost forecasting?] *Beobachtungen der meteorologischen Stationen im Königreiche Bayern,* v. 10, **1884.** 24 p. Review in: *Meteorologische Zeitschrift,* 24(3):17–18, March **1889.** 3 tables. **DLC**—A report on verification of the dew point method for frost forecasting, based on observations made in Bavaria 1879–1888 (608 cases). *Subject Headings:* **1. Frost forecasting 2. Forecast verification 3. Bavaria, Germany.**

1886

4C–9 551.509.532 551.501.6:518.3

Kammermann, Arthur, **Die Vorausbestimmung des nächtlichen Temperatur-Minimums.** [Prediction of minimum night temperature.] *Meteorologische Zeitschrift,* 21(3):124–128, **1886.** 6 tables, 2 refs. Append., **Luftfeuchtigkeit und Nachtfrost.** [Air humidity and night frost.] By W. K. *Ibid.,* p. 123–124. fig. **DLC**—The pioneer work on objective forecasting of night minimum temperatures and radiation frost was published in 1884–6 by Dr. Lang of Munich and A. Kammermann of Geneva. The paper by Lang, published in March 1884 in the *Zeitschrift des landwirtschaftlichen Vereins* (Bonn), gave a table for forecasting *frost* or *no frost* on the basis of evening air temperature (2°, 4°, 6°, 8°, 10°, 12° or 14°C) and the relative humidity or wet bulb depression which would give a dew point of 0°C. This was also presented in the form of a nomogram which would give the same criteria with less accuracy but more ease in interpolation (from 0° to 15°C, 0° to 6° depression of wet bulb or 0–100% relative humidity). The nomogram and table, and examples of the use of the nomogram, either with hygrometer or psychrometer readings, are cited by W. K. in his note in the *Met. Zeit.* which accompanies the paper of A. Kammermann. This note was unpublished for 1½ years, but the 3 later papers aroused interest in the earlier work of Lang. This type of objective aid is only valuable, according to Kammermann, if the dew point remains constant throughout the night and day. He shows by examples from Munich, St. Petersburg, Tiflis, Barnaul Sitka and Melbourne, that the minimum temperature averages 1° to 2°C lower (at 4 or 5 a.m.) than the dew point at 2, 6 or 10 p.m. the night before. A. Kammermann summarizes several papers wherein he shows the number of times in each month (Jan. 1883–May 1885) that the morning minimum was higher (or lower) than the 10 p.m. dew point. Since it is *lower* in over 50% of the cases, it is concluded that a better criterion must be found, and this according to Kammermann is the wet bulb temperature. The variability of the wet bulb minimum temperature for 1882, 3, 4 and 5 is shown to be less than that of the temperature − minimum temperature, or the dew point-minimum temperature; and the 1 p.m. wet bulb is said to be a better criterion even than the 10 p.m. dew point. *Subject Headings:* **1. Minimum temperature forecasting 2. Frost forecasting 3. Kammermann's formula 4. Lang's formula 5. Nomograms.**—*M.R.*

1887

4C–10 551.524.37(42)

Andrews, William A., **Famous frosts and frost fairs in Great Britain: chronicled from the earliest to the present time.** London, Redway, **1887.** 91 p. illus. **DWB**—A chronology, with descriptive accounts and illustrations, of > 100 instances when notable frosts or freezes occurred in England and Scotland. Considerable data is included for "recent" cases and an amazing amount of facts on the earlier instances dating back to A.D. 134. Frequently the Thames froze over at London so that as early as 695 accounts told of booths being erected on the ice on the Thames, and from 1604 on, fairs were held on the ice, printing presses set up, etc. Several freezes lasted 5 months. The milder cases occurred about every 20 years and the more protracted about once or twice a century, on the average, but with no periodicity or regularity. Damage to vegetation was often extreme. *Subject Headings:* **1. Severe winters 2. Chronology 3. Frost fairs 4. London, England 5. Great Britain.** —*M.R.*

4C–11 551.509.532

Kersnovskiĭ, B., **Zur Frage über die Vorausbestimmung des Temperatur-minimums.** [On the prediction of minimum temperatures.] *Akademiia Nauk, SSSR, Meteorologischeskiĭ Sbornik,* 11(6), Sept. 15, **1887.** 15 p. 9 tables. In German. **DLC**—A report on the experimental verification of minimum temperature forecasting methods. These investigations were carried out during 1884–1886 in St. Petersburg by the Central Observatory. *Subject Headings:* **1. Minimum temperature forecasting 2. Forecast verification 3. Leningrad, U.S.S.R.**

4C–12 551.509.532

Lang, E., **Die Vorausbestimmung des Nachtfrostes.** [Night frost prediction.] *Das Wetter,* 4(4):73–87, April **1887.** 3 figs., tables. **DWB**—A further investigation of the possibility of frost forecasting by means of dry and wet bulb temperature observations. *Subject Headings:* **1. Frost forecasting 2. Wet bulb temperature.**

1888

4C–13 551.509.532

†*Wollny, Edward, **Untersuchungen betreffend die Methoden der Vorausbestimmung der Nachtfröste.** [Investigations of methods of night frost prediction.] *Forschungen aus dem Gebiete der Agrikultur-Physik,* Heidelberg, 11:133–153, **1888.** numerous tables and refs. **DWB**—A special study to verify the frost forecasting methods of LANG (dew point method) and KAMMERMANN, was carried out during the summer of 1887. It showed the lack of accuracy of the dew point method and gave more satisfactory results with KAMMERMANN's method. The predicted minimum temperature, in most cases, was lower than the observed. *Subject Headings:* **1. Frost forecasting 2. Forecast verification 3. Kammermann's formula.**

1889

4C–14 551.524:016

†Fassig, Oliver L. (*ed.*), **Bibliography of meteorology. A classed catalogue of the printed literature of meteorology from the origin of printing to the close of 1881, with a supplement to the close of 1887, and an author index. v. 1, Temperature.** Washington, D. C., Signal Office, **1889.** 381 p. Lithographed. **DLC**—In a collection of over 50,000 titles by 12,500 authors on various fields of meteorology there are over 500 references to frosts and freezes in spring, summer, fall and winter under the headings: "Non-periodical temperature variation" and "Frost" (p. 101–163). Imprints cover the period from 1595 to 1887. Many of the citations were contributed by foreign meteorologists. *Subject Headings:* **1. Bibliographies 2. Temperature bibliographies 3. Frost bibliographies. I. U. S.Army. Signal Corps.**—*M.R.*

1890

4C–15 551.509.532

Kersnovskiĭ, B., **Über die Vorausbestimmung des nächtlichen Temperatur-minimums aus Beobachtungen in Astrachan, Elissawetgrad und Warschau.** [On night temperature minima prediction from observations in Astrakhan, Elisavetgrad and Warsaw.] *Akademiia Nauk, SSSR, Meteorologicheskiĭ Sbornik,* 13(10), May 29, **1890.** 22 p. plate, 14 figs. **DLC**—A continuation of the author's earlier attempt to verify the Kammermann method (wet bulb temperature) of frost forecasting for St. Petersburg by extending the study to an analysis of 3 years of records at Astrakhan. Elisavetgrad (Kirovo) and Warsaw. The relations between minimum temperature and wet bulb, and minimum temperature and dew point are shown graphically for each month (April–Oct.) for

each of the 4 respective stations. Conditions under which observations are taken, and detailed data for each decade of each month of each year, are discussed and presented in this excellent monograph. *Subject Headings:* **1. Minimum temperature forecasting 2. Astrakhan, U.S.S.R. 3. Kirovo, U.S.S.R. 4. Warsaw, Poland.**—*M.R.*

1891

4C–16 551.524.37(42)

Stow, Fenwick W., **"South-East frosts" with special reference to the frost of 1890–1891.** *Royal Meteorological Society, Quarterly Journal*, 17(79):176–179, July **1891.** table. **DLC**—A description of frost conditions in Yorkshire, England (dates, duration in days, temperature, wind direction), accompanied by south-easterly winds, made on the basis of observations during the period from 1851 to 1891. The author analyzes temperature variations with height in the layers near the ground. *Subject Headings:* **1. Frost distribution 2. Wind direction 3. Yorkshire, England.**

1892

4C–17 551.524.37(44)

*MacDowall, Alex. B., **Zahl der Frosttage zu Paris seit 1802.** [Number of frost days in Paris since 1802.] *Meteorologische Zeitschrift*, 27(6):240, June **1892.** table. **DLC**—Short report on annual number of days with frost in Paris from 1801–1890. A good correlation is found between these data and Brückner's period of solar activity. *Subject Headings:* **1. Frost frequencies 2. Long period records 3. Brückner's cycle 4. Paris, France.**

1893

4C–18 551.524.37:551.509.532

Lemström, Selim, **On night-frosts and the means of preventing their ravages.** *Finska Vetenskaps-Societeten, Helsinki, Acta*, 20(3), **1893.** 78 p. map, 4 plates, tables. **DWB**—A study of frosts based on the author's observations during a fifteen year period. Very often night frosts occur in higher latitudes during the growing season causing great damage to vegetation. The author describes his own experiments, discusses conditions accompanying summer frosts and methods of frost forecasting and prevention of frost damage. *Subject Headings:* **1. Summer frosts 2. Frost forecasting 3. Frost prevention 4. Finland.**

1894

4C–19 551.524.37:551.509.532

Homén, Theodore, **Bodenphysikalische und meteorologische Beobachtungen mit besonderer Berücksichtigung des Nachtfrostphänomens.** [Soil physical and meteorological observations with special reference to night frosts.] Berlin, Kommissionsverlag Mayer and Müller, **1894.** 225 p. tables, refs. **DA**—An exhaustive study containing, in the first and second chapters, a description of special observations of soil temperatures made during Aug.–Sept. 1893 at Härjänvatsa (Finland) and analysis of these observations in relation to heat exchange between soil and air. The problem of evaporation and formation of dew is investigated in the third chapter. In the fourth chapter the author analyzes the weather conditions and thermal state of soil in relation to frost formation. The problem of forst forecasting is discussed in the first chapter and in chapter 6, plant damage by frost is considered. *Subject Headings:* **1. Frost forecasting 2. Frost damage to plants 3. Evaporation 4. Dew formation 5. Härjänvatsa, Finland.**

1895

4C–20 551.524.37(759)

*Abbe, Cleveland, **Florida freezes for a century and a half.** *Monthly Weather Review*, 23(9):336–337, Sept. **1895.** tables. **DLC**—Orange trees were killed around Charleston, S. C., on Feb. 7, 1747, when the temperature went down to 10°F. On Jan. 2, 1766 all citrus and many tropical trees around St. Augustine, Fla., were killed. The worst freeze, lasting 10 days, occurred in Feb. 1835, when the temperature fell to near zero in northern Florida, killing all citrus trees north of 28°N lat. *Subject Headings:* **1. Severe winters 2. Frost damage to citrus orchards 3. Florida.**—*M.R.*

4C–21 551.524.37(479)

Sharrer, G. I., **Vlianie surovykh zim na kul'turnuiu rastitel'nost' v Tiflise.** [Influence of cold winters on cultivated vegetation in Tiflis.] *Tiflis. Botanicheskiĭ Sad, Trudy*, 1:23–28, **1895. DLC**—A review of the winter regime in Tiflis during 1859–1889, and description of damage to garden plants caused by frost. During the cold winters of 1859, 1874 and 1883 in Tiflis, air temperature reached −16, −19°R (−4, −11°F). *Subject Headings:* **1. Severe winters 2. Frost damage to plants 3. Tiflis, Georgia, U.S.S.R.**

4C–22 551.524.37(479)

*Timofeev, S. N., **Ocherk klimaticheskikh uslovii Tiflisskogo Botanicheskogo Sada.** [Outline of the climatic conditions of the Botanical Garden in Tiflis.] *Tiflis. Botanicheskii Sad, Trudy,* 1:11–22, **1895.** tables, ref. **DLC**—Climatic analyses based on 12 years of observation, including tables of number of days with frost. *Subject Headings:* **1. Climate of Tiflis 2. Frost frequencies 3. Tiflis, Georgia, U.S.S.R.**

1896

4C–23 551.509.62:634

Hammon, William H., **Injury from frost and methods of protection.** *U. S. Weather Bureau, W.B.* No. 86, **1896.** 12 p. tables. **DLC, DWB**—A brief note on the formation of frost, best locations for orchards or gardens to avoid frost, and 5 methods of frost prevention. Forecasting from dew point or psychrometer readings is recommended and explained. *Subject Headings:* **1. Frost prevention 2. Frost protection of orchards 3. Frost forecasting.**—*M.R.*

1897

4C–24 551.524.37(431/5)

*Schwalbe, G., **Über die Häufigkeit der Frost-, Eis- und Sommertage in Nordeutschland.** [On frequency of frost, ice and summer days in northern Germany.] *Meteorologische Zeitschrift,* 32(5):161–170, May **1897.** tables. **DLC**—Tables and analysis of observational data for the period of 1848–1894 from many stations of northern Germany are presented. *Subject Headings:* **1. Frost frequencies 2. Long period records 3. Northern Germany.**

4C–25 551.524.36(47)

*Varnek, A., **Raspredelenie absoliutnykh naibol'shikh i naimen'shikh temperatur i ikh amplitud na prostranstve Rossiiskoĭ Imperii.** [Distribution of absolute maximum and minimum temperatures and their amplitudes in Russia.] *Akademiia Nauk, SSSR, Fizikomatematicheskii Otdel, Zapiski, Ser.* 8, 5(6):1–16, **1897.** 3 maps, tables. **DLC**—The author presents a summary of long period observations on air temperature for Russia, and neighbouring countries. *Subject Headings:* **1. Air temperatures 2. Minimum temperature frequencies 3. U.S.S.R.**

1899

4C–26 551.524.37(771)

Abbe, Cleveland and Smith, J. Warren, **Destructive frost of June 30, 1899, in Ohio.** *Monthly Weather Review,* 27(7):311, July **1899. DLC**—An unusually late frost occurred over Hardin, Allen, Hancock and Marion counties in Ohio, under anticyclonic conditions at a time when the reported minimum shelter temperature was nowhere lower than 46°F. ABBE attributes this occurrence to subsiding cold air analogous to the inverse phenomenon of rising columns of warm, moist air. *Subject Headings:* **1. Summer frosts 2. Subsidence 3. Ohio.**—*M.R.*

1900

4C–27 551.524.37(431/5)

*Kremser, V., **Beiträge zur Frage der Kälterückfälle im Mai.** [Contributions to the problem of cold waves in May.] *Meteorologische Zeitschrift,* 35(5):209 214, **1900.** tables, 3 refs. **DLC**—The author shows by a careful analysis of frost frequency and mean minimum temperatures in various decades (1848–1898), and for every 3-day period in May (Berlin and Klaussen, Germany) that although there are singularities in every decade, they do not occur during the same 3-day period in any 2 decades. Thus, the average long term tendency is to smooth out any irregularities and give a continuous drop in frost frequency and rise in mean minimum temperature from the first to the last of May. He cautions the meteorologist to be critical and cautious in drawing conclusions from meteorological data. *Subject Headings:* **1. Frost frequencies 2. May frosts 3. Singularities 4. Germany.**—*M.R.*

4C–28 551.524.37(431,438)

*Kremser, V., **Über die klimatischen Verhältnisse des Memel-, Pregel- und Weichsel-Gebietes.** [On the climatic conditions in the Memel, Pregel and Weichsel regions.] *Meteorologische Zeitschrift,* 35(7,8):289–317, 337–355, July, Aug. **1900.** tables, refs. **DLC**—On p. 343–355 is presented a critical and analytical summary of the number of frost and "ice" days at a number of stations in the East Prussia—Poland area. The data are analyzed by months for several period-lengths, and the length of the growing season in each year and for the mean and extreme years tabulated. *Subject Headings:* **1. Frost frequencies 2. Freezing days 3. Growing season 4. East Prussia, Germany 5. Poland.**—*M.R.*

4C–29 551.590.21:551.524.37

MacDowall, Alex B., **Sunspots and frost.** *Nature*, London, 62(1616):599, Oct. 18, **1900.** 3 tables. **DLC**—A brief study on the relation between amount of frost days and sunspot variations, based on the Greenwich observations since 1841. The comparison shows an increase of frost days near the date of sunspot minimum. The summer air temperatures give also an increase about the time of sunspot maximum. *Subject Headings:* **1. Frost frequencies 2. Sunspot effects 3. Greenwich, England.**

4C–30 551.524.37(433)

Rudel, Kaspar, **Zur Frage des Auftretens der Eismänner in Bayern.** [On the problem of "Ice-saints" occurrences in Bavaria.] *Meteorologische Zeitschrift*, 35(8):373–375, Aug. **1900. DLC**—The frequency of night frosts in May, and especially in the "Ice-saints" days (May 12–14) is not as great as folks think, according to a careful analysis of records for Bavaria. *Subject Headings:* **1. Frost frequencies 2. May frosts 3. "Ice-saints" 4. Bavaria, Germany.**

1903

4C–31 551.524.37:551.584.4(47)

Ivanov, V. A., **K voprosu o nochnykh zamorozkakh.** [On the problem of night frosts.] *Rossiĭskoe Obshchestvo Sadovodstva, Simferopol'skiĭ Otdel, Zapiski*, 35:18–25, **1903.** Review in: *Zhurnal Opytnoĭ Agronomii*, 4(4):512, **1903. DLC**—Report on special observations made by the author in an orchard. The wide variations of air temperature and its dependence on height above the surface and some other factors are investigated. *Subject Headings:* **1. Frost conditions 2. Nocturnal frosts 3. Orchards 4. Crimea, U.S.S.R.**

4C–32 551.524.36(83)

Martin, Karl, **Temperatur-Extreme im Innern von Chile.** [Temperature extremes in central Chile.] *Meteorologische Zeitschrift*, 38(8):378–379, Aug. **1903.** table. **DLC**—This brief report on highest and lowest temperatures shows that in central Chile air temperatures can be as low as −11° to −20°C. *Subject Headings:* **1. Temperature extremes 2. Chile.**

4C–33 551.509.532(431/5)

*†Ziegra, Alfred, **Untersuchungen der "Nachtfrostprognose nach Kammermann" für mehrere meteorologische Stationen Nord- und Mitteldeutschlands.** [Investigation of the "Night frost forecast according to Kammermann" for many meteorological stations of North and Central Germany.] *Das Wetter*, 20:158–162, 177–181, 198–208, 226–233, 250–256, July–Nov. **1903.** numerous tables and refs. **DWB**—A study of the accuracy of KAMMERMANN's frost forecasting method. The author gives reduction coefficients to use in this formula for many places in Germany. *Subject Headings:* **1. Frost forecasting 2. Forecast verification 3. Kammermann's formula 4. Germany.**

1904

4C–34 551.524.37(485)

*Hamberg, H. E., **Die Sommernachtfröste in Schweden 1871–1900.** [Summer night frosts in Sweden 1871–1900.] (*K.*) *Svenska Vetenskaps-Akademien, Stockholm, Handlingar*, 38(1), **1904.** 94+5 p. 4 figs., 46 tables, append. **DWB, DLC**—A comprehensive analysis of frost frequency and intensity for all of Sweden, based on very detailed records for May–Sept. 1871–1900. An original scale of intensity is used in this climatological study, the results being presented in elaborate tables for numerous stations, for each month and year. Several chapters giving an analysis of effects of frost on harvests of grain and root crops are included, along with an extensive chronology of frosts and damage in various regions. *Subject Headings:* **1. Summer frosts 2. Frost frequencies 3. Frost damage 4. Sweden.**

1905

4C–35 551.524.37(899)

Walker, Herbert J., **Frost in Uruguay.** *Meteorological Magazine*, London, 40(473):83, June **1905. DLC**—Severe frosts are observed every winter in Uruguay. Temperatures as low as −13°F were registered while the author was living there. *Subject Headings:* **1. Temperature extremes 2. Uruguay.**

1906

4C–36 551.524.37(73) 551.555.6

§Garriott, Edward B., **Cold waves and frost in the United States.** *U. S. Weather Bureau, Bulletin P*, **1906.** 22 p. 328 charts. *U. S. Weather Bureau, W.B.* No. 355. **DWB**—A major contribution to climatology of the U.S.A., containing chronological descriptions and data on severe cold periods (1717-date), arranged by regions and seasons. A series of 328 synoptic charts are

presented for 58 situations from 1888 to 1902. Fifteen of these series are for spring and for autumn freezes in various parts of the U.S.A. Notable minima are given, along with the description of each synoptic situation. The worst and most damaging freeze on record occurred on Feb. 10–15, 1899, when subzero temperatures were reported as far south as Louisiana and Florida. *Subject Headings:* **1. Cold waves 2. Freezes 3. Growing season 4. Synoptic conditions for frost 5. Chronology 6. United States.**—*M.R.*

4C–37 551.524.37(433)

Knoche, Walter, **Die Zeitdauer zwischen dem letzten und ersten Frosttage in Preussen.** [Interval between last and first frost in Prussia.] *Das Wetter*, 23(10):217–221, Oct. **1906.** map, table. **DWB**—A study of duration of frost free periods in Prussia for 104 stations, based on observations during 1890–1899. *Subject Headings:* **1. Frost free period 2. Prussia, Germany.**

1907

4C–38 551.524.37:91

*†Dorscheid, Otto, **Die mittlere Dauer des Frostes auf der Erde.** [The mean duration of frost on earth.] *Meteorologische Zeitschrift*, 24(1,2):11–24, 49–36, Jan., Feb. **1907.** 14 tables, 55 refs. **DWB**—A comprehensive study of frost conditions made on the basis of long period observations for the three continents and the North Polar region. The author presents an exhaustive table of frost duration periods for numerous points. *Subject Headings:* **1. Frost duration data 2. Europe 3. Asia 4. North America 5. Arctic Region.**

1908

4C–39 551.524.37(744)

Milham, Willis Izbister, **A two years study of spring frost at Williamstown, Mass.** *Monthly Weather Review*, 36(8):250–254, Aug. **1908.** fig., 4 tables, 4 refs. **DLC**—The following problems are investigated: prediction of the probable minimum temperature, variations in the severity of frost at different places within a small area and variations in the severity of frost with varying distance above the ground. *Subject Headings:* **1. Spring frosts 2. Minimum temperature forecasting 3. Williamstown, Mass.**

4C–40 551.524.37

Rein, Richard, **Untersuchungen über den Kältetod der Pflanzen.** [Investigations on the death of plants by cold.] *Zeitschrift für Naturwissenschaften*, Leipzig, 80(1/2):1–38, Sept. 10, **1908.** 10 figs., 7 tables, numerous refs. **DLC**—Investigation on the influence of frost on plant development. Special attention is paid to the relation between duration and intensity of frost and damage to vegetation. *Subject Heading:* **1. Frost damage to plants.**

4C–41 551.509.532(42)

Strachan, Richard, **Indications of approaching frost.** *Royal Meteorological Society, Quarterly Journal*, 34(145):47–50, Jan. **1908.** 3 tables, refs. **DLC**—Investigation based on observations made at the Greenwich Observatory on the possibility of night frost forecasting by measuring dew point in the evening. *Subject Headings:* **1. Frost forecasting 2. Greenwich, England.**

4C–42 551.509.532

Wells, Edward L., **Relation of Weather Bureau to horticulture.** *Better Fruit*, London 5(4):44–46, **1908.** **DA**—Description of Weather Bureau service on frost forecasting and warning for different districts of the United States. *Subject Headings:* **1. Frost forecasting services 2. U. S. Weather Bureau 3. United States.**

1909

4C–43 551.524.37 551.509.532(775)

*Bartlett, James L., **Frost in Wisconsin: occurrence, prediction, and methods of prevention.** *Wisconsin. University, Bulletin*, No. 290, May **1909.** 43 p. 9 plates, 6 tables, refs. *Wisconsin. Univ. University Extension Series*, 1(2). **DWB**—The various types of frost are defined and the atmospheric conditions (temperature, wind, moisture, clouds), topographic conditions (elevation, slope, water surface, soil cover) and temperature inversions influencing frost formation are analyzed. The occurrence of frost in Wisconsin, including the killing variety and light frosts, frost prediction both from local signs and weather maps, frost damage to crops and frost protection are discussed. Charts giving average date for killing frost in spring and autumn and weather maps for specific frost dates and tables giving average frost limits at different points and sections of Wisconsin, light and killing frosts at Madison, and weather conditions preceding frosts are included. *Subject Headings:* **1. Frost data 2. Frost forecasting 3. Wisconsin.**—*I.L.D.*

4C–44 551.506:551.524.36(45)

*Eredia, Filippo, **La temperatura in Italia.** [Temperature in Italy.] *Italy. Ufficio Centrale di Meteorologia e Geodinamica, Annali*, 31(1), **1909.** 239 p.+33 maps, 25 figs., tables, refs. Abstracted from reprint. **DWB**—Complete analysis of data on temperature conditions for each year and station in Italy. In Chap. 5 (p. 182–185) an analysis of minimum temperature frequencies is given. *Subject Headings:* **1. Extreme temperatures 2. Italy.**

4C–45 551.524.37:551.509.532:551.574.42

Rolet, Antonin, **Les gelées.** [Frosts.] Paris, Collection A.-L. Guyot, **1909.** 124 p. **DWB**—Complete investigation of frost and its importance as an ecological factor. The physics of frost, weather conditions important to frost formation and methods of frost prediction (KAMMERMAN and DOLLFUS) are described in the first chapter. The author reviews methods of frost prevention and analyzes in detail the role of frost as an ecological factor especially for grape, fruit trees, olives, cereals and flowers. Special attention is paid to the problem of hoar frost formation and influence of hoar frost deposit on vineyard and quality of wines. *Subject Headings:* **1. Physics of frost 2. Frost forecasting 3. Frost prevention 4. Hoar frost formation 5. Frost effects 6. Horticulture 7. Kammermann's formula.**

4C–46 551.524.37(47)

Vangengeĭm, F. P., **K voprosu o minimal'nykh temperaturakh nizhnikh sloev vozdukha.** [On the problem of minimum-temperatures of the air layers near the ground.] *Trudy po Sel'skokhoziaĭstvennoĭ Meteorologii*, Leningrad, 5:27–35, **1909.** 3 figs., 7 tables. **DLC**—Report on special observations during 6 years (1902–1907) at Uiutnoe experimental station in Kursk Province at a height of 10 cm above the ground. Investigations showed that at night the air layer at 10 cm above the surface is usually cooler than the soil surface and the layer at a height of 3.47 m (the height of the screen), and night frost forms at 10 cm height layer much oftener than on soil surface or on screen. *Subject Headings:* **1. Vertical temperature gradient 2. Frost pockets 3. Kursk, U.S.S.R.**

1910

4C–47 551.509.532:634.7

§*Cox, Henry J., **Frost and temperature conditions in the cranberry marshes of Wisconsin.** *U. S. Weather Bureau, Bulletin T*, Dec. 31, **1910.** 121 p. 31 figs., 22 tables. **DLC**—A major treatise on the conditions favorable for frosts which occur in cranberry bogs in general, and especially in Wisconsin. Numerous cases of damaging frost are analyzed, synoptic charts reproduced and automatic and visual records presented in detail. Special stations were set up in the marshes and the exposures described are shown in photographs. Comparative readings at different heights and within and outside the bogs are shown in tables and graphs. Methods of cultivation, flooding, sanding, draining, etc. are discussed from a historic as well as a constructive viewpoint. Frost has occurred as early as Aug. 8 (1904) and as late as June 13 (1906) on the Wisconsin bogs, doing considerable damage to unflooded bogs, but none to bogs that were flooded. Lowest temperatures recorded at nearby U. S. Weather Bureau stations were 45° or higher. As a result of the study, concrete rules are laid down for forecasting occurrence or non-occurrence of frost in these areas in late spring, summer or autumn. Soil temperature as well as local meteorological and general synoptic conditions are included as criteria. *Subject Headings:* **1. Frost forecasting 2. Frost data 3. Cranberry bogs 4. Wisconsin.**—*M.R.*

4C–48 551.524.37 551.582(569.4)

Exner, Felix M., **Zum Klima von Palästina.** [On the climate of Palestine.] *Deutscher Palästina-Verein, Zeitschrift*, 33:107–164, **1910.** 2 maps, tables, refs. **NN**—Climatic data, collected at stations in Palestine 1891–1907, are tabulated, summarized and discussed. Temperatures for the various physical regions, including days with frost in Jerusalem, are presented, as well as humidity and evaporation; cloudiness; winds and air pressure data. (*Same item as* 2E–35, May 1951, *M.A.B.*) *Subject Headings:* **1. Frost frequencies 2. Climate of Palestine 3. Palestine.**—*H.P.K.*

4C–49 551.524.37:551.509.62

McAdie, Alexander G., **Experiments in frost protection.** *Monthly Weather Review*, 38(12):1894–1895, Dec. **1910.** 2 figs. **DLC**—Description of various methods used to protect orchards in California and a recommendation that covers be used whenever possible. The temperature inside and outside a new type of paper cover used for protecting deciduous trees is shown on thermograph traces made on 4 nights in Nov. 1910. *Subject Headings:* **1. Frost protection 2. Paper covers.**—*M.R.*

4C–50 551.524.37:634:632.1

Paddock, Wendell and Whipple, Orville B., **Fruit growing in arid regions.** New York, Macmillan, **1910.** 393+20 p. 98 figs. **DLC**—Chap. 19 (p. 324–354, 10 figs.) entitled "Frost injuries, secondary bloom, and frost protection" contains a discussion of fruit damage at different temperatures below the freezing point and methods of natural and artificial protection against frost. *Subject Headings:* **1. Frost damage to orchards 2. Horticulture 3. Frost protection.**

4C–51 551.509.62

Wells, Edward L., **Frost fighting in the Boise Valley.** *Monthly Weather Review*, 38(7):1120–1121, July **1910. DLC**—Some observations during the spring of 1910 on the change of air temperature during smudging on frost nights. This was the first year that orchard heaters had been used in this valley. *Subject Headings:* **1. Frost prevention 2. Orchard heating 3. Boise, Idaho.**—*M.R.*

1911

4C–52 551.524.37(794)

Bonnet, W. E., **Frost fighting in California vineyards.** *Monthly Weather Review*, 39(4):611–612, April **1911. DLC**—A review of meteorological conditions, protective measures, and damage to grapes (50%) during one of the latest frosts (April 13, 1911) to occur in the vineyards near Fresno, California. *Subject Headings:* **1. Frost damage to grapes 2. Vineyards 3. Fresno, California.**

4C–53 551.509.532:551.524.37(763/4)

Cline, Isaac M., **Freezes of November 13 and 29/30, 1911, in the sugar, orange and trucking region.** *Monthly Weather Review*, 39:1714–1716, Nov. **1911. DLC, DWB**—Temperature fell to 26° on Nov. 13 in sugar and orange region of Louisiana and Texas but timely warnings allowed planters to windrow the cane to prevent splitting. The freeze of the 29th and 30th gave temperatures of 19° to 26° in this region. New Orleans had a minimum of 31°—only 2° higher than absolute minimum for Nov. As a result of 48 hours warning, most orange growers smudged and saved trees from damage and fruit from spoiling and truck gardeners flooded fields. Reports from recipients of warnings, which saved several millions of dollars, are presented. *Subject Headings:* **1. Frost warnings 2. Cold waves 3. Sugar cane 4. Citrus orchards 5. Louisiana.**—*M.R.*

4C–54 551.506:551.524.37

*Day, Preston C., **Frost data of the United States, and length of crop-growing season, as determined from the average of the latest and earliest dates of killing frost.** *U. S. Weather Bureau, Bulletin V*, **1911.** 5 p. 5 charts. *U. S. Weather Bureau, W.B.* No. 449. **DLC**—Charts based on data for 150 stations in the U.S.A. Contains: I. Average date of last killing frost in spring; II. Average date of first killing frost in autumn; III. Latest date of killing frost in spring; IV. Earliest date of killing frost in autumn; V. Average length of frost-free season. East of the Rockies, 5-day isolines are drawn (Feb. 15–June 1) (Sept. 15–Dec. 20); 10 day (April 1–June 20) (Aug. 20–Nov. 20) and on V—100 days to 330 days on the 5 respective charts enumerated above. West of the Divide, actual data for each station are plotted on isolines. *Subject Headings:* **1. Frost atlases 2. Frost data 3. Frost free period 4. United States.**—*M.R.*

4C–55 551.509.62(795)

Lewis, C. I. and Brown, F. R., **Preliminary frost fighting studies in the Rogue River Valley.** *Oregon Agricultural Experimental Station, Bulletin*, No. 110, **1911.** 62 p. 19 figs. **DA**—Detailed description of experimental investigations in pear and apple orchards during 1909–1911 and a summary of methods used to forecast frost and to provide warnings for fruit growers in the area. The effectiveness and economics of various kinds of burners or heaters was evaluated on the basis of elaborate reports from each orchard. *Subject Headings:* **1. Frost forecasting 2. Orchard heating 3. Rogue River Valley, Oregon.**—*M.R.*

1912

4C–56 551.524.37(792):632.111 551.509.62

*Alter, J. Cecil, **Does frost fighting pay in Utah?** *Monthly Weather Review*, 40(4):606–608, April **1912.** 2 tables. **DLC**—Calculation of the cost of orchard heating under various degrees of falling temperature. Periods of frost damage during 1897–1911 are tabulated for Corinne and Provo in Utah. *Subject Headings:* **1. Frost damage 2. Orchard heating 3. Utah.**

4C–57 551.509.532(79)

Beals, Edward Alden, **Forecasting frost in the North Pacific States.** *U. S. Weather Bureau, Bulletin*, No. 41, Feb. 27, **1912.** 49 p. 3 figs., 3 diagrams, 4 charts, 6 tables, refs. **DWB**—A description of the evolution of the frost warning system in Washington, Oregon, Idaho, and a

discussion on the meteorological conditions predetermining the probable occurrence of frost in these states. *Subject Headings:* **1. Frost warning services 2. North Pacific States.**

4C–58 **551.524.37:634**

McAdie, Alexander G., **Note on thawing and defrosting.** *Monthly Weather Review*, 40(10):1574, Oct. **1912.** **DLC**—Discussion on the relation between frost damage to orchards in California and the rapid rise of temperature after the frost period. *Subject Headings:* **1. Frost damage to orchards 2. California.**

4C–59 **551.524.37(4)**

Schröder, Paul, **Karte der Häufigkeit der Schwankungen um den Frostpunkt.** [Map of frequency of temperature oscillations around the freezing point.] *Petermanns Geographische Mitteilungen*, Gotha, 58:266–267, May **1912.** map, 2 refs., append. **DLC**—A special investigation, based on long period observations, covering the whole of Western Europe. Five groups of frost frequency are indicated on the map. *Subject Headings:* **1. Frost frequencies 2. Western Europe.**

1913

4C–60 **551.524.37(433/4)**

Alt, Eugen, **Frostgrenzen und Frosthäufigkeit in Süddeutschland.** [Frost boundaries and frequency in southern Germany.] *Meteorologische Zeitschrift*, 30(2):104–106, Feb. **1913.** table, refs. **DWB**—An analysis of dates of the last spring frost compared with the date of "advent of spring," according to the maps of SCHMAUSS in *Petermann's Mitteilungen*, for Bavaria and the Rhine Region. *Subject Headings:* **1. Spring frosts 2. Bavaria, Germany 3. Rhine Region, Germany.**

4C–61 **551.524.37:551.509.532**

McAdie, Alexander G., **Frost studies—determining probable minimum temperatures.** *Monthly Weather Review*, 41(4):623–625, April **1913.** **DLC**—Three ways of air cooling (radiation, convection and conduction) are studied. The author states that conduction is an unimportant factor in heat loss, but the chief cause in temperature lowering during frosty nights is radiation, which must be used as the main component in the formula for frost prediction and in other works on frost investigation. *Subject Headings:* **1. Frost forecasting formulas 2. Nocturnal cooling.**

4C–62 **551.524.37(794)**

McAdie, Alexander G., **Report on recent destructive frosts in California.** *Monthly Weather Review*, 41(1):120–122, Jan. **1913.** 4 tables. **DLC**—During the past 35 years (1878–1913) temperatures recorded in California were often as low as 24°F and caused severe damage to citrus fruits. The author analyzes weather conditions during the frost periods and distribution of minimum temperatures recorded in different points of the state. *Subject Headings:* **1. Frost damage to citrus orchards 2. Frost frequencies 3. California.**

4C–63 **551.524.37:632.11**

Pedaev, D. N., **Bor'ba s zamorozkami.** [Frost prevention.] *Progressivnoe Sadovodstvo i Ogorodnichestvo*, St. Petersburg, No. 12–14, **1913.** Review in: *Zhurnal Opytnoĭ Agronomii*, St. Petersburg, 13(4):654, **1913.** **DLC**—The author lists conditions conducive to frost formation (nocturnal cooling by outgoing radiation, decrease of air humidity, calm weather, etc.) and describes frost prevention methods used abroad. *Subject Headings:* **1. Radiation frosts 2. Frost prevention.**

4C–64 **551.524.37:551.43**

Soldatov, V., **Bor'ba s ineiami v gornykh padiakh.** [Frost prevention in mountain valleys.] *Zabaĭkal'skiĭ Khoziain*, Irkutsk, No. 17/18:7–10, **1913.** Review in: *Ulan-Ude, U.S.S.R. Buriato-Mongol'skiĭ Gosudarstvennyĭ Nauchno-issledovatel'skiĭ Institut Kul'tury, Bibliografia Buriato-Mongolii.* 3:221, **1946.** **DLC**—In mountain valleys of Eastern Siberia, cold katabatic winds frequently cause late spring and early autumn frosts and make agriculture impossible. The name "ineĭ" (hoar frost) is a local term for early and late frosts. *Subject Headings:* **1. Frost prevention 2. Orographic effects 3. Air drainage 4. Frost pockets 5. Eastern Siberia, U.S.S.R.**

1914

4C–65 **551.509.532(79)**

Beals, Edward A., **Frost forecasts and protection in Oregon, Washington and Idaho.** *Monthly Weather Review*, 42(10):587, Oct. **1914.** **DLC**—Local peculiarities of frost forecasting and the activity of the Weather Bureau Warning System in the Pacific Northwest are discussed. *Subject Headings:* **1. Frost forecasting 2. Frost warning services 3. Oregon 4. Washington 5. Idaho.**

4C–66 551.509.532:551.524.37(794)

*Carpenter, Ford Ashman, **Utilization of frost warnings in the citrus region near Los Angeles, Calif.** *Monthly Weather Review*, 42(10):569–571, Oct. **1914.** 33 figs., table. **DLC**—Physico-geographical peculiarities of the country, temperature variations caused by local environment and air pressure conditions before the occurrence of frost are analyzed and discussed. A description of the frost warning system at Los Angeles and the utilization of these warnings is also presented. *Subject Headings:* **1. Fruit frost forecasting 2. Local frost conditions 3. Citrus orchards 4. Frost warning services 5. Los Angeles, California.**

4C–67 551.524.37(431/5) 551.509.31

Hennig, Robert, **Eintritt und Ende einer Frostperiode in Süddeutschland mit besonderer Berücksichtigung der geographischen Lage und der aerologischen Messungen.** [Beginning and end of a frost period in southern Germany with special reference to geographic position and aerological measurement.] *Meteorologische Zeitschrift*, 31(3):109–120, March **1914.** 6 figs., ref. **DWB**—Author emphasizes the importance of the Alps in synoptic forecasting. Southern Germany is surrounded by mountains, causing favorable conditions for the development of a dangerous weather situation: a stagnating high over southern Germany connected with a high over the Alps. A series of practical synoptic rules for the forecast of frost near Frankfurt a.M. proved by experience is given. Typical cases are illustrated by temperature—height curves for Friedrichshafen and Lindenberg. *Subject Headings:* **1. Orographic effects 2. Frost forecasting rules 3. Southern Germany.**—*A.A.*

4C–68 551.524.37:551.311

†Högbom, Bertil, **Über die geologische Bedeutung des Frostes.** [On the geological significance of frost.] *Uppsala. Universitet. Mineralogisk-Geologiska Institut, Bulletin*, 12:258–389, **1914.** 49 figs., 140 refs. Abstracted from reprint. **DLC**—A fundamental treatise on the action of frost and glaciers on rocks, soil, geomorphology, etc. Polygonal frost formations in soil, solifluction, etc. are discussed extensively and analytically. *Subject Headings:* **1. Weathering by frost 2. Frost effects on soil 3. Glacial action.**—*M.R.*

4C–69 551.509.62

Humphreys, W. J., **Frost protection.** *Monthly Weather Review*, 42(10):562–569, Oct. **1914.** 2 figs. Discussion by Garthwaite J. W., p. 571–572. **DLC**—Author analyzes in detail conditions favorable for frost, and reviews the principal and the most important methods of frost protection (selection of location, frost resistant varieties, delaying flowering by piling snow or ice around trees, or by spraying with whitewash, ground covering, changing air drainage, mechanical mixing of air, spraying with water, screening, smudging, dry heating and flooding). *Subject Headings:* **1. Local frost conditions 2. Frost prevention. I. Garthwaite, J. W.**—*M.R.*

4C–70 551.524.37:581.1

Maksimov, N. A., **Rasteniia i nizkie temperatury.** [Plants and low temperatures.] *Trudy po Sel'sko-khoziaĭstvennoĭ Meteorologii*, 13:8–36, **1914.** 19 refs. **DWB**—A special investigation on the influence of low temperatures (below freezing point) on development of plants. A review of previous investigations on this problem by many others is given. *Subject Heading:* **1. Frost effects on plants.**

4C–71 551.524.37(431/5)

*Richter, Wilhelm, **Der Einfluss von Breite, Länge und Meereshöhe auf die frost- und schneefreien Zeiten im Deutschen Reiche.** [Influence of latitude, longitude and altitude on frost and snow free periods in Germany.] *Meteorologische Zeitschrift*, 49(9):436–440, Sept. **1914.** 2 tables, 8 refs. **DLC, DWB**—An analysis of frost duration period and its dependence on geographical position of observation point. The author presents results of 20 years of observation in tables, shows the duration of frost and snow periods for principal points of Germany and their variation with height. *Subject Headings:* **1. Frost duration 2. Vertical frost distribution 3. Germany.**

4C–72 551.524.37:551.509.532(77)

*§Smith, J. Warren, **Frost warnings and orchard heating in Ohio.** *Monthly Weather Review*, 42(10):573–583, Oct. **1914.** 19 figs., 9 tables. **DLC**—A comprehensive description of different methods of orchard heating used for prevention of frost damage and results of heating in 1913 and 1914 in Ohio. The author investigates the weather situations and other factors favorable to frost formation, discusses some deficiencies in the methods of frost prediction and proposes several rules for minimum temperature forecasting. Many illustrative photographs, thermograph and synoptic charts and data for stations in Ohio are included. *Subject Headings:* **1. Frost formation 2. Orchard heating 3. Frost forecasting 4. Ohio.**

4C–73 551.524.37(764)

*Sprague, Malcolm, **Frosts and frost protection in Texas.** *Monthly Weather Review*, 42(10):590, **1914. DWB**—A general description of frost conditions in Texas, the incidence of cold waves, heating measures adopted in the citrus and truck garden areas of south Texas, and forecast service for frost. A second article entitled "Frost protection by irrigation in southern Texas," by JOSEPH L. CLINE (p. 591–592) goes into more detail about freezes and protective measures, and gives monthly and annual minimum temperatures from 1887–1913 at Brownsville and Corpus Christi, Texas. *Subject Headings:* **1. Frost data 2. Frost protection 3. Texas. I. Cline, Joseph L.**—*M.R.*

1915

4C–74 551.524.37

McAdie, Alexander G., **Temperature inversion in relation to frosts.** *Harvard College Observatory, Annals*, 73:168-177, **1915.** 4 figs. **DWB**—Author emphasizes the importance of "local air drainage" in the formation of ground frosts, discusses single cases of temperature inversions observed at Blue Hill and gives suggestions for frost protection. *Subject Headings:* **1. Frost formation 2. Temperature inversions 3. Air drainage 4. Blue Hill, Mass.**—*A.A.*

4C–75 551.509.532

Ol'dekop, E., **Prilozhenie teorii korreliatsii k voprosu o predskazanii nochnogo minimuma temperatury na estestvennoĭ poverkhnosti pochvy.** [Application of the correlation theory to the problem of prediction of night minimum temperature near the ground.] **1915.** Unchecked.—A description of author's method of late spring and early autumn frost forecasting. *Subject Heading:* **1. Minimum temperature forecasting.**

4C–76 551.524.37

Reed, William Gardner, **Outline for the study of frost and protection against frost damage.** *Journal of Geography*, Madison, Wisc., 14(2):54–55, Oct. **1915.** 6 refs. **DLC**—In this brief note the author remarks that frost damage is due to low temperature and not to the formation of frost, "black-frost," or daytime freezing. The actual damage depends upon the degree and duration of the cold. *Subject Heading:* **1. Frost.**

4C–77 551.524.37:551.509.532:016

†Reed, William Gardner and Feldkamp, Cora L., **Selected bibliography of frost in the United States.** *Monthly Weather Review*, 43(10):512–517, Oct. **1915.** 94 refs. **DLC**—Annotated bibliography on frost, frost forecasting and frost prevention for the period 1896–1915 and an index of works, state by state. *Subject Headings:* **1. Frost bibliographies 2. United States.**

4C–78 551.524.37

Via Raventos, José, **Las heladas tardiás y las nubes artificales.** [Late frost and artificial clouds.] Tarragona, Spain, Camara Agricola Oficial de la provincia de Tarragona, **1915.** 35 p. **DWB**—A short description of weather conditions in the spring favorable for frost formation and analysis of the results of frost damage prevention by artificial smoke and clouds. The author notes that it has been known since Roman times (record of PLINY) that artificial clouds are effective against frost. Artificial clouds as prevention against frost were first used in Bavaria in 1791 and in 1860 at Avignon, France. *Subject Headings:* **1. Spring frosts 2. Frost prevention 3. Artificial clouds.**

1916

4C–79 551.509.532

B——, I., **Priemy i rezul'taty predskazaniĭ zamorozkov i bor'by s poslednimi.** [Methods and results of frost forecasting, and frost prevention.] *Zabaĭkal'skiĭ Khoziain*, Irkutsk, No. 7/8:5-12, **1916.** Review in: *Ulan-Ude, U.S.S.R. Buriato-Mongol'skiĭ Gosudarstvennyĭ Nauchno-issledovatel'skiĭ Institut Kul'tury, Bibliografiia Buriato-Mongolii*, 1:333, **1939. DLC**—The possibility of forecasting the date of the first and last frost in Eastern Siberia is discussed. The method of KAMMERMANN-KOROSTELEV is analyzed and some protective measures undertaken, outlined. *Subject Headings:* **1. Frost forecasting 2. Kammermann's formula 3. Eastern Siberia, U.S.S.R.**

4C–80 551.509.532

B——, I., **Metod Kammermana-Korosteleva dlia predskazaniia zamorozkov v Vostochnoĭ Sibiri.** [Kammermann-Korostelev method of night frost forecasting in Eastern Siberia.] *Zabaĭkal'skiĭ Khoziain*, Irkutsk, No. 5/6:1–9, **1916.** 5 tables. Review in: *Ulan-Ude, U.S.S.R. Buriato-Mongol'skiĭ Gosudarstvennyĭ Nauchno-issledovatel'skiĭ Institut Kul'tury, Bibliografiia Buriato-

Mongolii, 1:333, 1939. **DLC**—Results of the application of this method are discussed. The lowest temperatures are given in tables. *Subject Headings:* **1. Frost forecasting 2. Kammermann's formula 3. Eastern Siberia, U.S.S.R.**

4C–81 551.524.37:551.509.532(73/9)

†§Cox, Henry J., **Frost warnings.** (In: **Weather forecasting in the United States.** *U. S. Weather Bureau, W.B.* No. 583:177–215, 1916. maps.) **DWB**—A very important paper on frost forecasting. The author describes conditions for frost formation, effects of topography upon frost, investigates the relationship between air temperature and vegetation, presents numerous charts of frost dates and synoptic situation during frost in the United States. A complete description of methods of frost forecasting and their prognostic peculiarities for many districts of this country is given in the last part of the work. *Subject Headings:* **1. Physics of frost 2. Orographic effects 3. Frost effects on plants 4. Frost forecasting 5. United States.**

4C–82 551.524.36

*Defant, Albert, **Die nächtliche Abkühlung der unteren Luftschichten und der Erdoberfläche in Abhängigkeit vom Wasserdampfgehalt der Atmosphäre.** [Nocturnal cooling of the lower air layers and of the earth surface depending on the water vapor content of the atmosphere.] *Akademie der Wissenschaften, Vienna, Math.-Naturwiss. Klasse, Sitzungsberichte, Abt. 2a,* 125(10):1537–1623, 1916. 8 figs., 16 tables. **DWB**—Classical study on the cooling of the air during clear nights and calm weather (or light wind), using temperature observations from 1090 nights for all seasons in Kremsmünster and Tiflis. Data given for vapor pressure (e), wind speed, temperature decrease (ΔT for the first 4 hours after sunset). Simple relationship proposed: $\Delta T = \alpha(T - \theta)$; α —constant with slight variations; $\theta = a - b\epsilon^{-ce}$; a, b, c—constants; ϵ—basis of natural logarithms. θ shows a good agreement with observations for both stations located in different climates. The nocturnal cooling on mountains (Sonnblick Observatory 3105 m) increases with water vapor. *Subject Headings:* **1. Nocturnal cooling 2. Orographic effects 3. Kremsmünster, Austria 4. Sonnblick, Austria 5. Tiflis, Georgia, U.S.S.R.**—*A.A.*

4C–83 551.524.37(433)

Rudel, Kaspar, **Frostwechsel.** [Frost variation.] *Meteorologische Zeitschrift,* 33(7):324–326, July 1916. table. **DWB**—Study of duration of frost period during 1881–1915. The maximum number of days with frost for a 5-year period in Nürnberg was 106 days and minimum 87 days. *Subject Headings:* **1. Frost frequencies 2. Nürnberg, Germany.**

4C–84 551.524.37(431)

*Schubert, Johannes, **Kalte Mainächte in Eberswalde.** [Cold May nights in Eberswalde.] *Das Wetter,* 33(4):75–83, April 1916. 4 figs., tables, 10 refs. **DWB**—An investigation of temperature observations, analysis of the relation between the speed of fall of temperature during the night, wind, and humidity. Statistical review of frequency of frost in May based on observations during 1876–1915. *Subject Headings:* **1. May frosts 2. Frost frequencies 3. Eberswalde, Germany.**

1917

4C–85 551.524.37:634.8

Gladwin, F. E., **Winter injury of grapes.** *New York Agricultural Experiment Station, Geneva, N. Y., Bulletin,* No. 433, April 1917. 139 p. 10 tables, 8 plates, refs. **DWB**—The temperatures experienced during the winters of 1909–10 and 1915–16 near Fredonia, N. Y., are reviewed in an attempt at determining just when the fruit buds of the grape vines were injured by freezing. The heavy frosts in Oct. or Dec. 1909 could have damaged the buds, and in 1916 the extreme cold (−16°F) in March after a warm spell in Jan. could have caused the injury. The type of injury is shown in photographs. Records for several years are compared to show wherein the two winters when damage occurred differed from other winters. *Subject Headings:* **1. Frost damage to grapes 2. Severe winters 3. Fredonia, N. Y.**—*M.R.*

4C–86 551.524.37(72)

Lopez, E., **The first autumn frost in Mexico.** *Revista Agricola,* San Jacinto, Mexico, 1(4):131–133, 1917. map. Review in: *International Review of the Science and Practice of Agriculture,* Rome, 10(2):138 Feb. 1919. **DLC**—A study on the first autumn frost, which caused great damage in 15 districts of the state (the high table-land "mesetas"). The formation of this frost was associated with a high pressure area in the north or northwest, coming from the United States, and a well defined cyclonic zone in the south. The first frost in 1917 was recorded on Sept. 25–26th. *Subject Headings:* **1. Autumn frosts 2. Synoptic conditions for frost 3. Mexico.**

4C–87 551.524.37:631.4

†Loske, E., **Obzor rabot po sel'skokhoziaĭstvennoĭ meteorologii i po voprosam s neiu sviazannym. Chast' I. Otnoshenie pochvy k meteorologicheskim faktoram.** [Survey of studies on agricultural meteorology and problems related to it. Pt. I. Relation between soil and meteorological factors.] *Trudy po Sel'skokhoziaĭstvennoĭ Meteorologii*, Leningrad, v. 8–17, **1911–1917.** 914 p. tables, refs. **DLC**—One of the more comprehensive earlier scientific surveys on the interaction between soil and atmosphere, based on a large number of works published mainly in Russian and German. Author discusses soil temperature on the surface and in deeper layers, heat capacity and other heat properties, influence of vegetative cover, rainfall and snow, fertilizers and microclimatological peculiarities and gives samples of observations. Chap. 2 deals with the influence of frost on the soil (soil fertility, compactness, structure, air and water permeability, etc.). Chap. 3 and 4 deal with moisture in the soil (moisture capacity, hydroscopicity, dew in the soil, movement of moisture, infiltration and percolation, capillar moisture). Sixty-five pages are devoted to evaporation from soil and drying of the soil. Chap. 5–7 (283 p.) of this fundamental work, published in v. 11 (1915), deal with the relation of percolation to precipitation and with the influence of precipitation and snow cover on soil. Chap. 8–10 (279 p.) are published in v. 17 (1917); information on contents not available. A second part dealing with the influence of meteorological factors on plants was never published. *Subject Headings:* **1. Soil—atmosphere interaction 2. Frost effects on soil 3. Soil temperatures 4. Soil moisture 5. Evaporation from soil.**—*A.A.*

4C–88 551.509.532

Marvin, Charles F., **Historical note.** *Monthly Weather Review*, 45(8):407, Aug. **1917.** **DLC**—Brief history of investigations on the problem of frost forecasting and checking of formulas presented by DONNEL, WELLS and SMITH. *Subject Heading:* **1. Frost forecasting formulas.**

4C–89 551.509.532

Reed, William G., **Practical hint in forecasting minimum temperature.** *Monthly Weather Review*, 45(12):590, Dec. **1917.** 3 eqs. **DLC**—Some remarks on the possibility of using the Smith-Donnel method for minimum temperature forecasting in the region of Pomona, Calif. *Subject Headings:* **1. Minimum temperature forecasting 2. Smith-Donnel formula 3. California.**

4C–90 551.509.532

Smith, J. Warren, **Predicting minimum temperatures.** *Monthly Weather Review*, 45(8):402–407, Aug. **1917.** 11 tables, eqs. **DLC**—The author proposes a formula for calculating night minimum temperatures, where the probable variations of night temperatures are determined from the so called median temperatures, evening observations of dew point and relative humidity. The formula is: $Y = a + bR$, where Y is the probable difference between the expected minimum temperature and the value of dew point observed in the evening, R—the evening relative humidity, a and b—constant values different for each station. A mathematical verification showed that the formula can be applied with good results to frost forecasting on clear, still nights. *Subject Headings:* **1. Frost forecasting 2. Smith's frost formula.**

4C–91 551.524.37(47)

*Tol'skiĭ, A., **K voprosu o zamorozkakh.** [On the problem of frosts.] *Meteorologicheskiĭ Vestnik*, 27(11–12):209–214, Nov./Dec. **1917.** tables. **DWB**—Analysis of frost conditions and their frequency in Borovoe, Samara (Kuibyshev) Province, based on observations during 1905–1917. *Subject Headings:* **1. Frost frequencies 2. Borovoe, Kuibyshev Province, U.S.S.R.**

1918

4C–92 551.524.37(54):633.61

Barnes, J. H., **The effect of frost on sugarcane in the Gurdaspur District, India.** *Indian Agricultural Research Institute, Delhi, Bulletin*, No. 69:55–61, **1918.** Review in: *International Review of the Science and Practice of Agriculture*, Rome, 10(2):139–140 Feb. **1919.** **DA, DLC**—A study on the nature and extent of damage caused by frost in Dec.–Jan. and a discussion of preventive methods. *Subject Headings:* **1. Frost damage to sugarcane 2. Frost prevention 3. Gurdaspur, India.**

4C–93 551.509.332

Defant, Albert, **Die nächtliche Abkühlung der unteren Luftschichten und der Erdoberfläche in Abhängigkeit vom Wasserdampfgehalt der Atmosphäre.** [Nocturnal cooling of lower air layers and soil surface depending on the water vapor content of the atmosphere.] *Meteorologische Zeitschrift*, 53(9–10):224–245, Sept.–Oct. **1918.** 3 figs., 8 tables, 4 refs., 8 eqs. **DLC**—A theoretical study of the problem of nocturnal cooling near the ground. The equation can be used for night frost forecasting. *Subject Headings:* **1. Nocturnal cooling 2. Frost forecasting formulas 3. Defant's formula.**

4C–94 551.509.332

*Hallenbeck, Cleve, **Night temperature studies in the Roswell fruit district.** *Monthly Weather Review*, 46(8):364–373, Aug. **1918.** 8 figs. **DLC**—A comprehensive study of the conditions of night cooling in this region, which includes practically all of the fruit growing and farming districts of the Pecos Valley. On the basis of observations of the main weather station and six substations the author analyzes in detail the importance of warmer or colder air, topographical influence, local inequalities, etc., and establishes a formula for local frost forecasting. *Subject Headings:* **1. Nocturnal cooling 2. Frost forecasting 3. Microclimatology 4. Pecos Valley, New Mexico.**

4C–95 551.509.532

Nichols, Esek S., **Prediction of minimum temperatures in Grand Valley, Colo.** *Monthly Weather Review*, 46(5):213–228, May **1918.** 13 figs., 5 tables. **DLC**—An analysis of the hygrometric formula of J. WARREN SMITH showed that this formula is applicable to points located many miles away from the station where the hygrometric observations were taken. The formula may be used not only during clear nights, but also when the sky is partly cloudy. The constants of the formula vary with seasons and stations. *Subject Headings:* **1. Frost forecasting 2. Smith's frost formula 3. Grand Valley, Colo.**

4C–96 551.524.37:551.525.5(435.25)

*Schumacher, A., **Frostgrenzen im Erdboden nach Beobachtungen in Bremen 1898 bis 1917.** [Frost limits in the soil according to observations in Bremen 1898–1917.] *Meteorologische Zeitschrift*, 53(78):198–199, July/Aug. **1918.** 2 tables. **DLC**—Based on soil temperature observations at depths of 0, 2, 5, 10, 20, 50, 100, 200 and 300 cm. The dates of first and last freezing temperatures in the soil, and the lag between air and soil freezing, the extreme depth of frost penetration and date thereof are tabulated for each winter at Bremen (1898–1917), and results discussed. *Subject Headings:* **1. Soil freezing data 2. Air—soil temperature lag 3. Bremen, Germany.**—*M.R.*

4C–97 551.524.37:633.11

Vieules, G., **The effect of cold, wind and rust on various wheats, in France.** *Revue Internationale de Génétique*, Paris, 5(3):79–91, March 15, **1918.** Review in: *International Review of the Science and Practice of Agriculture*, Rome, 10(3):254–256, March **1919.** table, 3 refs. **DLC**—A brief description of frost conditions in various places of France and investigation and classification of varieties of wheat according to their resistance to frost. *Subject Headings:* **1. Frost 2. Frost resistant wheat 3. France.**

1919

4C–98 551.524.37

Dabney, T. G., **Curious differentiation in frost effects.** *Science, N. Y., New Ser.*, 49(1265):310–311, March 28, **1919.** **DLC**—A report on observations of frost damage. The author observed that in the old Mississippi River channel the vegetation showed no effect of frost, but at the same time the cotton in the field remote from the river bank was completely killed. The cause of this, according to the author, lies in the character of the soil. *Subject Headings:* **1. Frost damage to cotton plants 2. Soil influences.**

4C–99 551.524.37(73)

Kincer, Joseph Burton, **Relation between vegetative and frostless periods.** *Monthly Weather Review*, 47(2):106–110, Feb. **1919.** 5 figs., table, refs. **DWB**—Charts and graphs show relation between growing season at different latitudes in the U. S. A. as represented by data for Key West, Nashville, Atlanta, Wichita, Cleveland and Moorehead (Minn.). The places where killing frost occurs every year, $>\frac{1}{2}$ the years, $<\frac{1}{2}$ the years, etc., are shown in a composite graph. *Subject Headings:* **1. Frost frequencies 2. Growing season 3. United States.**—*M.R.*

4C–100 551.524.37(73)

*Ward, Robert DeCourcy, **Frost in the United States.** *Geographical Review*, N. Y., 7:339–344, May **1919.** 3 maps, 7 refs. **DLC**—A brief but comprehensive analysis of frost conditions in this country. The author studied three degrees of frost (light, heavy and killing) and presents a description of the nature and occurrence of frost, the dates of the last killing frosts in spring and first killing frosts in autumn, and their variations. An analysis of the duration of the growing season is made for different parts of the United States. *Subject Headings:* **1. Frost frequencies 2. Killing frosts 3. Growing season 4. United States.**

1920

4C–101 551.509.532(794)

Alciatore, Henry F., **New methods of predicting orchard temperatures in the San Diego citrus district.** *Monthly Weather Review, Supplement*, No. 16:70–76, **1920.** 2 figs., 12 tables. **DLC**—

A critical analysis of many methods of minimum temperature forecasting at San Diego and a classification of weather situations favorable for frosts. According to verification, the best results were obtained with the formula of J. W. SMITH. The author also determines the relationship between minimum temperatures at San Diego and in the neighboring orchard station. *Subject Headings:* **1. Frost forecasting formulas 2. Forecast verification 3. Citrus orchards 4. San Diego, Calif.**

4C–102 **551.509.532(794)**

Alciatore, Henry F., **A statistical method for predicting minimum temperatures.** *Monthly Weather Review, Supplement*, No. 16:59–63, **1920.** 9 tables, eqs. **DLC**—The report is a summary of 10 unpublished works by the author, testing old and new methods of minimum temperature prediction for San Diego, Calif. The author derives several formulas for frost forecasting and presents results of their verification made in San Diego and at some nearby California stations. *Subject Headings:* **1. Minimum temperature formulas 2. Objective forecasting 3. San Diego, Calif.**

4C–103 **551.509.532(792)**

Alter, J. Cecil, **Forecasting minimum temperatures in Utah.** *Monthly Weather Review, Supplement*, No. 16:46–49, 1920. fig. **DLC**—Description of local influences in frost forecasting characteristics of forecasts intended for shippers and sheep growers, horticulturists, alfalfa growers, hydroelectrical works and some practical remarks for the forecaster. *Subject Headings:* **1. Minimum temperature forecasting 2. Local frost conditions 3. Utah.**

4C–104 **551.509.532**

Belden, W. S., **Predicting minimum temperatures.** *Monthly Weather Review, Supplement*, No. 16:32–34, **1920.** 7 figs., 3 tables, 2 refs., eqs. **DWB**—Report on investigation in the vicinity of St. Joseph, Mo., during the critical frost period in the spring of 1918. Temperature forecasts were reached by combining the results of two methods: 1) the median temperature hour method and 2) the hygrometric method, and were found superior to forecasts made by either method alone. (*Same item as* 3E–14, May 1952, *MAB.*) *Subject Headings* **:1. Minimum temperature formulas 2. St. Joseph, Mo.**

4C–105 **551.509.532:634.7**

*Franklin, H. J., **Cape Cod cranberry frosts.** *Monthly Weather Review, Supplement*, No. 16:20–30, 1920. fig., 13 tables, 7 refs., eqs. **DLC**—An elaborate report on the experimental verification of different methods for frost forecasting, and especially of SMITH's method, carried out at the Agricultural Experimental Station in East Wareham, Mass. Special observations of pressure, humidity and wind as forecasting factors were used for this purpose. In conclusion, the author discusses the ways to protect bogs from frost. *Subject Headings:* **1. Frost forecasting 2. Smith's frost formula 3. Forecast verification 4. Cranberry bogs 5. Cape Cod, Mass.**

4C–106 **551.524.37:551.525.2:551.509.532**

Franklin, T. Bedford, **The cooling of the soil at night with special reference to late spring frosts.** *Royal Society of Edinburgh, Proceedings*, 39(2):120–136, **1918/1919.** 3 figs. 8 tables, 2 refs.; 40(1):10–22, 1919–1920. 8 tables, ref. **DLC**—A comprehensive study of the processes of nocturnal cooling of the soil surface and of air layers near the ground. The author discusses the methods of observation, analyzes the effect of radiation, evaporation, precipitation, and presents an equation for frost forecasting. In conclusion, a comparison of the forecasted and observed minimum temperatures on the open soil, during clear nights is given. *Subject Headings:* **1. Nocturnal cooling 2. Spring frosts 3. Frost forecasting formulas**

4C–107 **551.509.532**

Garret, Charles C., **Predicting minimum temperatures in the Walla Walla, Wash., frost-warning district.** *Monthly Weather Review, Supplement*, No. 16:50–52, **1920.** **DLC**—A modified form of the "Donnel formula" was used for frost forecasting, $T = D - \frac{H-40}{4}$, where T is the expected minimum of temperature, H—relative humidity at 6 p.m., D—dew point at 6 p.m. A verification, carried out during two winters (1917 and 1918), showed that the minimum was the same as estimated on 5 nights, higher than the estimated on 25 nights and lower on 16 nights. An application of SMITH's formula to the observations of the same 46 nights indicated that the observed minimum was the same as estimated by the formula for 5 nights, the observed minimum was higher 24 times and 17 times lower than estimated by the formula. The greatest differences between the actual and the estimated minimum were ±9°. A difference of 4° or less as recorded 29 times out of the 46 nights. The Walla Walla district is especially favored by dynamically heated winds from several directions. *Subject Headings:* **1. Minimum temperature forecasting 2. Frost forecasting formulas 3. Forecast verification 4. Walla Walla, Washington.**

4C-108 551.509.532

McEwen, George F., **The minimum temperature, a function of the dew point and humidity, at 5 p.m. of the preceding day; method of determining this function by successive approximations to group averages.** *Monthly Weather Review, Supplement*, No. 16:64–69, 1920. 3 figs., 5 tables, ref. **DLC**—The author discusses the general principles and practical application of an objective method of frost forecasting involving 15 approximations. The relations between air temperatures, dew point and humidity are determined either from a nomogram or from tables or charts. *Subject Headings:* **1. Frost forecasting formulas 2. Successive approximation method 3. San Diego, California.**—*M.R.*

4C-109 551.509.532

Marvin, Charles F., **Predicting minimum temperatures from hygrometric data.** *Monthly Weather Review, Supplement*, No. 16:5, 1920. ref. **DLC**—Remarks on the importance of statistical methods used by Prof. J. W. Smith for complete investigations of the relation between weather and crops, and for fitting a curve to obtain a formula for predicting minimum temperatures. *Subject Headings:* **1. Frost forecasting formulas 2. Statistical techniques.**

4C-110 551.509.532

Nichols, Esek S., **Notes on damage to fruit by low temperatures; prediction of minimum temperatures.** *Monthly Weather Review, Supplement*, No. 16:37–45, 1920. 9 figs., 6 tables, 6 refs. **DLC**—A description of damage done by frost in the region of Grand Junction, Colorado, and a review of special investigations during the frost season of 1919, which were made for the purpose of establishing the local factors (constants) in equations for frost prediction. *Subject Headings:* **1. Frost forecasting formulas 2. Frost damage to fruit 3. Objective forecasting 4. Grand Junction, Colorado.**

4C-111 551.509.532

Smith, J. Warren, **Predicting minimum temperature from hygrometric data.** *Monthly Weather Review, Supplement*, No. 16:6–19, 1920. 24 figs. Abstract in: *Ibid.*, 47(12):848–849, Dec. 1919. **DLC**—The author presents a modification of his earlier (1917) equation, $y=a+bR$. Parabolic curves are fitted to data in scatter diagrams (evening relative humidity and dew point depression respectively, vs. variation of minimum from dew point next morning) for Cincinnati, El Paso, Boise, Chicago University, Grand Junction, Phoenix and San Diego. The curves using dew point depression instead of humidity as R in the formula gave more promising results. The paper was read before the meeting of the Philosophical Society of Washington (Dec. 20, 1919) and the American Meteorological Society in St. Louis (Dec. 30, 1919). *Subject Headings:* **1. Minimum temperature forecasting 2. Smith's frost formula.**—*M.R.*

4C-112 551.509.532

Young, Floyd D., **Forecasting minimum temperatures in Oregon and California.** *Monthly Weather Review, Supplement*, No. 16:53–58, 1920. 7 figs., 2 tables. **DLC**—Special investigations on the development and application of the hygrometric formula presented by C. A. Donnel in 1912 $\left(\text{minimum } T = \text{dew point} - \frac{\text{relative humidity} - 40}{4}\right)$. Best results were obtained when the constant was changed from 40 to 30 (partially cloudy sky) and to 20 (clear sky). The value 40 is good enough when the sky is cloudy. The second modification of the formula is related to values of the dew point and relative humidity. *Subject Headings:* **1. Minimum temperature forecasting 2. Donnel's hygrometric formula 3. Oregon 4. California.**

1921

4C-113 551.509.532

Ångström, Anders, **Studies of the frost problem.** *Geografiska Annaler*, 2(1):20–32, 1920. 3 tables, 12 refs., eqs. **Pt. 2.** *Ibid.*, 3(3):278–290, 1921. 2 figs., table. Review by Wilhelm Schmidt in: *Meteorologische Zeitschrift*, 57(4):126, 1922. 3 refs. **DLC**—A theoretical study on the problem of nocturnal cooling of air. The author analyzes the conditions important to falling temperature at night (humidity, wind, cloudiness), establishes the relationship between the preceding weather conditions and the degree of temperature decrease during the night, investigates the synoptic conditions and presents formulas for computing the temperature minimum from evening observations. *Subject Headings:* **1. Nocturnal cooling 2. Frost forecasting 3. Synoptic conditions for frost 4. Ångström's formula. I. Schmidt, Wilhelm.**

4C-114 551.524.37(431/5,494,436)

*Alt, Eugen, **Die mittlere Temperaturverteilung in Süddeutschland. Frostgrenzen und Frosthäufigkeit in Süddeutschland.** [Mean temperature distribution in southern Germany. Frost

limits and frequency in southern Germany.] Munich, **1921.** 6 p.+20 maps, tables. Review by W. Köppen, in: *Meteorologische Zeitschrift*, 57(1):29–30, Jan. **1922.** **DLC**—A comprehensive study of frost conditions based on long period observations at 144 stations in southern Germany (1865–1919), 100 stations in Austria (1851–1900) and 22 stations in Switzerland (1864–1900). *Subject Headings:* **1. Frost frequencies 2. Long period records 3. Germany 4. Austria 5. Switzerland. I. Köppen, Wladimir P.**

4C–115 551.524.37:634.1

Chevalier, Aug., **Les applications de la météorologie agricole à la pomologie.** [The application of agricultural meteorology to pomology.] *Congrès International de Venise, Section de Météorologie Agricole, Bulletin*, Paris, No. 2:55–63, **1921.** 6 refs. **DWB**—The author studies the influence of frost on trees and determines the frost danger periods for the cider apple. These are: frosts in winter (sometimes killing the trees or putting them in a state of physical weakness), and spring frosts (coming unexpectedly at the moment of entry into the vegetation or blooming stage). *Subject Heading:* **1. Frost damage to orchards.**

4C–116 551.524.37:635.1/2(489)

Jensen, M., **The effect of frost upon roots and the best means of minimizing injury thus caused.** *International Review of the Science and Practice of Agriculture*, Rome, 12(4):382–383, April **1921.** **DLC**—Results of frost observations and investigations carried out at Hinderupgard, Odense, Denmark, regarding the effect of frost upon plants cultivated for their roots, and the best means of lessening the damage they may sustain. *Subject Headings:* **1. Frost damage to root crops 2. Frost protection 3. Odense, Denmark.**

4C–117 551.524.37(79.2)

Korstian, Clarence F., **Effect of late spring frost upon forest vegetation in the Wasatch Mountains of Utah.** *Ecology*, 2(1):47–52 Jan. **1921.** fig., 6 refs. **DLC** -An analysis of late frost conditions and frequency in Utah, and of damage done by frost to forests. *Subject Headings:* **1. Spring frosts 2. Frost damage to forests 3. Utah.**

4C–118 551.524.37:551.524.4(794/5)

*Young, Floyd D., **Nocturnal temperature inversion in Oregon and California.** *Monthly Weather Review*, 49(3):138–148, March **1921.** 20 figs., 8 tables, 7 refs. **DLC**—Investigations on nocturnal temperature inversion were carried out at Pomona, California and Medford, Oregon, during three frost seasons in 1918, 1919 and 1920. Between the base station and the other, at 225 ft above the base, the difference in minimum temperature was as great as 28°F, and the greatest inversions occurred during clear, calm nights following warm days. Observations on the 300 ft radio tower near Medford showed that minimum temperatures occur more than an hour later at the 150 ft level than at the base. *Subject Headings:* **1. Vertical temperature gradient 2. Nocturnal temperature inversion 3. Pomona, California 4. Medford, Oregon.**—*M.R.*

1922

4C–119 551.524.37:551.509.532

Ångström, Anders, **Einige Bemerkungen zu meinen Studien zum Frostproblem, mit besonderer Berücksichtigung eines Referats von W. Schmidt.** [Some remarks on my study of the frost problem with special reference to the article by W. Schmidt.] *Meteorologische Zeitschrift*, 57(10):361–363, Nov. **1922.** 3 refs., 8 eqs. **DLC**—A discussion of Schmidt's review, and mathematical analysis of Defant's formula for night frost forecasting. *Subject Headings:* **1. Frost forecasting formulas 2. Defant's formula. I. Schmidt, W.**

4C–120 551.509.532:634.7

Bliss, George S., **Forecasting minimum temperatures for the cranberry bogs of New Jersey.** *Monthly Weather Review*, 50(10):529–533, Oct. **1922.** 8 figs., 7 tables. **DLC**—This investigation shows that to get better results of minimum temperature forecasting for cranberry bogs the hygrometric formula must be applied much more accurately. *Subject Headings:* **1. Minimum temperature formulas 2. Cranberry bogs 3. New Jersey.**

4C–121 551.509.532

Garret, Charles C., **Predicting minimum temperatures in the vicinity of Walla Walla, Washington.** *Monthly Weather Review*, 50(7):366–367, July **1922.** 2 refs. **DLC**—The results of a study of minimum temperature forecasting by different methods are given. The analyzed methods are: 1) Dew point—relative humidity charts, 2) Relation between maximum and minimum temperatures, 3) Subtracting a constant value from the evening wet-bulb temperature and 4) Prediction of the

minimum temperature from the median temperature hour. *Subject Headings:* **1. Minimum temperature forecasting 2. Walla Walla, Washington.**

4C–122 551.509.62:551.525:635

Haines, E. H., **Influence of varying soil conditions on night-air temperatures.** *Monthly Weather Review*, 50:363–366, **1922.** 5 refs. **DLC, DWB**—The amount of moisture in the soil, which depends on the type of soil and other soil properties, determines the minimum temperature which will occur on level ground unaffected by other factors. Advantages of sandy soils over peat, loam or clay in preserving warmth and avoiding frost in cranberry or vegetable gardens are stressed. Draining reduces evaporation and prevents night frost. Cultivation methods used in Wisconsin are described. Dense vegetative cover is said to increase frost hazard. Data are from survey by Cox (*see item* 4C–81 above). *Subject Headings:* **1. Frost prevention 2. Horticulture 3. Soil temperature influences 4. Cover influences 5. Wisconsin. I. Cox, Henry J.**—*M.R.*

4C–123 551.524.37(68)

*Hattersley, R. K., **Frost map of the Union of South Africa.** Pretoria, **1922.** 3 maps. **DWB** – Two detailed maps contain data of first and last frost and duration of frost period over the country. The third map shows, for the greatest part of the Union, the mean duration of the frost period (more than 50 days) and for the central zone (over 100 days), with maximum of 200 and more days in some regions. *Subject Headings:* **1. Frost duration 2. Frost frequencies 3. South Africa.**

4C–124 551.524.37

Henry, Alfred Judson, **A second experiment on cover crops.** *Monthly Weather Review*, 50(10): 526, Oct. **1922. DLC**—Observations by Eckley S. Ellison near Fontane, Calif., on the influence of cover crops on the frost hazard show that cover crops increase the frost hazard, but the increase is very small at night at 5 ft above the ground (less than ½°F). *Subject Headings:* **1. Frost hazard 2. Cover influences 3. Fontane, Calif.**

4C–125 551.509.532

Keyser, Elgie M., **Calculating of temperature extremes in Spokane County, Washington.** *Monthly Weather Review*, 50(10):526–528, Oct. **1922.** 2 figs. **DLC**—Report on application of different methods for extreme temperature forecasting to local conditions. *Subject Headings:* **1. Frost forecasting 2. Local frost conditions 3. Spokane County, Washington.**

4C–126 551.524.37(431/5)

*Schwalbe, G., **Über die Temperaturminima in 5 cm über dem Erdboden.** [On temperature minima at 5 cm above soil surface.] *Meteorologische Zeitschrift*, 57(2):41–46, Feb. **1922.** tables, 2 refs. **DLC**—The author presents an analysis of occurrence of frosts during the cold season in Germany, duration of frost period, and investigations of the distribution of temperature in air layers from the surface up to 2 m. Data of mean and lowest minima and frost period are presented in table for many stations of Germany. *Subject Headings:* **1. Microclimatic vertical temperature distribution 2. Minimum temperatures 3. Germany.**

4C–127 551.524.37

Young, Floyd D., **Influence of cover crops on orchard temperatures.** *Monthly Weather Review*, 50(10):521–526, Oct. **1922.** 8 figs., 5 tables. **DLC**—Experimental study of the effects of cover crops on temperature inversion near the ground and temperature distribution during frosty nights. *Subject Headings:* **1. Orchard temperatures 2. Cover influences.**

1923

4C–128 551.509.532

Ångström, Anders, **Studies of the frost problem. III.** *Geografiska Annaler*, Stockholm, 2(4):401–412, **1923.** 3 figs., refs. **DLC** Formula presented for prediction of night minimum temperature: $T_{min} = a + b\theta_0 + c\theta_1$ where a, b, c—are constants, θ_0 and θ_1—are the evening temperatures by dry and wet thermometers. (*See also* 4C–113 above.) *Subject Headings:* **1. Minimum temperature forecasting 2. Ångström's formula.**

4C–129 551.509.532

Bennett, Walter J., **Predicting minimum temperatures.** *Monthly Weather Review*, 51(2):83–84, Feb. **1923.** 2 refs. **DLC**—An experimental study on accuracy of frost forecasting by means of humidity and dew point methods made on the basis of five years of observation. It has been found that the predicted minimum was correct for 63% of all cases. But the average percentage of accuracy would be considerably greater if the minimum temperatures were predicted from the diurnal curve. *Subject Headings:* **1. Minimum temperature forecasting 2. Forecast verification.**

4C–130 551.524:551.584.31:634

*Cox, Henry J., **Thermal belts and fruit growing in North Carolina.** *Monthly Weather Review, Supplement*, No. 19, **1923.** 106 p. 25 tables, 78 figs., refs. Append. by W. N. Hutt: **Thermal belts from the horticultural viewpoint.** 7 tables. Abstract in: *Monthly Weather Review*, 47(12):879–880, Dec. **1919.** **DWB**—A model agricultural climatological study dealing with the thermal conditions in North Carolina associated with safe elevations for fruit growing; the extent and locations of thermal belts or frostless zones, where the air temperature minima average higher than at either the base or summit (the frosts of the valley and the freezes of higher elevations). Within this belt, which is a "verdant zone" the foliage is fresh and green as compared with that above and below. The contents include: a detailed description of the topography of the region, of the temperature and rainfall conditions, of the instrument exposure in relation to the individual slopes; an analysis of minimum and maximum temperature variations, of absolute maximum and minimum temperatures, range of temperatures, mean temperatures, of the characteristics of inversions, effects of variations of vapor pressure, relative humidity, temperature and wind duration and velocity upon inversion; the height of thermal belts; top freezes and norms; hour degrees of frost and the meteorological characteristics of verdant zones. Extensive numerical data, isopleths, diagrams, graphs and photographs are given. The appendix is an analysis of the phenological data on fruit trees in various thermal belts for the years 1914, 1915 and 1916 and the effect of thermal belts upon yield. *Subject Headings:* **1. Thermal belts 2. Frost pockets 3. Orographic effects 4. Horticulture 5. Microclimatology 6. North Carolina. I. Hutt, W. N.**—*I.L.D.*

4C–131 551.524.37:551.555.6(794)

Young, Floyd D., **Notes on the 1922 freeze in Southern California.** *Monthly Weather Review*, 51(11):581–585, Nov. **1923.** 8 figs., table. **DLC**—In Southern California, at an average interval of about 10 years, heavy frost was observed in the citrus district, which damaged fruits and trees to the extent of many millions of dollars. The author describes weather conditions accompanying these cold waves, damage caused by the 1922 freeze, and discusses the problem of orchard heating. *Subject Headings:* **1. Freezes 2. Frost damage to orchards 3. Citrus orchards 4. Southern California.**

4C–132 551.524.37(795)

*Young, Floyd D. and Cate, C. C., **Damaging temperatures and orchard heating in the Rogue River Valley, Oregon.** *Monthly Weather Review*, 51(12):617–639, Dec. **1923.** 54 figs. **DLC**—Report of a special study carried out by the Weather Bureau for the detailed development of all phases of orchard heating and more accurate methods of low temperature forecasting. The authors present a description of methods used during this investigation and results of observations in 1919–1923. *Subject Headings:* **1. Minimum temperature forecasting 2. Orchard heating 3. Rogue River Valley, Oregon.**

1924

4C–133 551.524.37(431/5)(494) 551.524.34

Maurer, J., **Die strengen Winter Süddeutschlands und der Schweiz, bewertet nach den grossen Seegefrörnen seit 1400.** [Severe winters in Southern Germany and Switzerland since the year 1400 determined from severe lake freezes.] *Meteorologische Zeitschrift*, 41(3):85–86, March **1924.** Trans. by W. W. Reed in: *Monthly Weather Review*, 52(4):222, April **1924.** table, 2 refs. **DLC**—From 1400 to 1923 there were 33 severe winters in south Central Europe; from 1435 to 1587 there were 15; 1588–1680—4; 1681–1800 –10; and from 1801 to 1923—4. *Subject Headings:* **1. Severe winters 2. Switzerland 3. Germany. I. Reed, W. W.** (*trans.*).

1925

4C–134 551.509.532

*Cook, Albert W., **The prediction of minimum temperatures for the Red River Valley.** *Monthly Weather Review*, 53(10):443–447, Oct. **1925.** 3 figs., 4 tables, 2 refs. **DLC**—Damage is often caused to sugar beet and potato crops in fields, storage bins or in transit through the Red River of the North Valley. In an attempt to forecast this, the author selects about 10 spring and the same number of autumn frost periods recorded at Grand Forks, N. Dakota, and constructs scatter diagrams and regression curves for relations between evening relative humidity and variation of the minimum from the dew point temperature, and for the relation between maximum and minimum temperature. It is shown in elaborate verification tables that the hygrometric formula gives the best fit. If cloud, wind, and synoptic conditions are also considered, even better forecasts can be made. *Subject Headings:* **1. Minimum temperature formulas 2. Objective forecasting 3. Root crop protection 4. Red River Valley, North Dakota.**—*M.R.*

4C–135 551.524.37(492)

*Hartman, Ch. M. A., **Eerste en laatste datum van vorst.** [Earliest and latest date of frost.] *Hemel en Dampkring*, 23(3):76–78, March **1925.** 2 tables, ref. **DWB**—Summary of frost observations in the Netherlands during 1894–1923. Mean, earliest and latest date of frost and duration of frost free period are presented. *Subject Headings:* **1. Frost free period 2. Frost data 3. Netherlands.**

4C–136 551.524.37(42)

Pick, William H., **Night frosts at Cranwell, Lincolnshire during the late autumn, winter and early spring.** *Royal Meteorological Society, Quarterly Journal*, 51(216):369–370, Oct. **1925. DLC**—Seven objectively determined "rules" for predicting frost from isobar, wind direction, wind speed and humidity conditions are presented, based on 4 years of data. *Subject Headings:* **1. Frost forecasting rules 2. Cranwell, England.**—*M.R.*

4C–137 551.509.532

Tsuberbiler, E., **K voprosu o predskazanii zamorozkov.** [On the problem of frost forecasting.] *Meteorologicheskiĭ Vestnik*, 35(9):193–196, Sept. **1925.** 4 figs. **DWB**—A development of BROUNOV's method of frost forecasting, based on measurements of the rate of decrease of air temperature during the period from 1 p.m. up to 9 p.m. and at 9 p.m. The verification of this method, on the basis of observations made by TIMIRIAZEV at the Academy Observatory (near Moscow) during 31 years, gave good results. *Subject Headings:* **1. Frost forecasting formulas 2. Temperature drop 3. Brounov's frost formula 4. Moscow Region, U.S.S.R.**

1926

4C–138 551.524.37:634.7(769)

Hemenway, Ansel F., **Late frost injury to some trees in central Kentucky.** *American Journal of Botany*, Lancaster, Pa., 13(6):364–366, June **1926.** 6 figs., table, 2 refs. **DLC**—A report of damage done by a late frost in spring 1921 at and near Lexington, Ken. On March 26, 1921 the temperature dropped as low as 19°F and on April 2, as low as 20°F. These frosts caused great damage to twigs of trees 2 and 4 years old. The author presents the results of his observations on the grade of injury to various species of trees. *Subject Headings:* **1. Spring frosts 2. Frost damage to trees 3. Lexington, Kentucky.**

4C–139 551.524.37(57)

Ivanov, V. K., **Vesennie zamorozki v Zapadnoĭ Sibiri.** [Spring frosts in Western Siberia.] *Sibirskoe Plodovodstvo i Ogorodnichestvo*, Omsk, No. 2:20–22, **1926.** Unchecked. *Subject Headings:* **1. Spring frosts 2. Western Siberia, U.S.S.R.**

1927

4C–140 551.524.37:551.555.6(47)

Dolgoschev, V. I., **O povtoriaemosti zamoroskov.** [On frost frequency.] *Klimat i Pogoda*, 3(1):23–24, **1927. DWB**—A report on periodicity of frost during spring and autumn 1926 in Belyĭ. The mean periodicity of seven cold waves during June–Dec. is found to be 28.3 days with variations from 26 to 30 days. *Subject Headings:* **1. Frost frequencies 2. Belyĭ, U.S.S.R.**

4C–141 551.524.37(431/5)

*Knoch, Karl, **Die Eintrittszeiten der Spät- und Früfröste in Norddeutschland.** [Dates of occurrence of late and early frosts in northern Germany.] *Berlin. (K.) Preussisches Meteorologisches Institut, Abhandlungen*, 8(10), **1927.** 24 p.+2 maps, 7 tables, refs. **DWB**—A comprehensive climatological study of frost conditions based on long period observations (for many stations the period is 1880–1925). Mean and extreme dates of late spring frost and early autumn frost are given in tables and maps, and discussed in detail. This investigation covers the whole territory of Germany except some parts located south of 49°N. *Subject Headings:* **1. Frost frequencies 2. Frost free period 3. Germany.**

1928

4C–142 551.524.37:551.509.532(58)

*Babushkin, L. N., **Zamorozki v Sredneĭ Azii.** [Early and late frosts in Central Asia.] Tashkent, Sredneaziatskiĭ Meteorologicheskiĭ Institut, Agronomicheskiĭ Otdel, **1928.** 33 p.+maps (app.), 20 tables. **DWB**—The author reviews methods of frost observation and prediction, which were developed previously in Russia and the United States and presents a complete analysis of frost conditions in Central Asia with tables of mean and extreme data of late spring and early autumn frosts. The applicability of different methods of frost forecasting (developed by KAMMERMANN,

OLDEKOP, MIKHELSON, J. WARREN SMITH, BROUNOV and others) for the Turkistan region is investigated and frost prevention operations discussed. *Subject Headings:* **1. Spring frosts 2. Autumn frosts 3. Frost frequencies 4. Frost forecasting formulas 5. Central Asia.**

4C–143 551.509.532

Ellison, Eckley S., **A critique on the construction and use of minimum-temperature formulas.** *Monthly Weather Review*, 56(12):485–495, Dec. **1928.** 10 figs., tables, 40 refs., 8 eqs. **DWB**—An exhaustive study of popular formulas for frost forecasting. After a detailed analysis of the conditions important for frost formation the author selects the linear formula suggested by YOUNG "as the superior formula of the hygrometric group." *Subject Headings:* **1. Frost forecasting formulas 2. Young's frost formula.**

4C–144 551.524.37

*†Foss, Haakon, **Nattefrost dens Årsaker og Bekjempelse.** [Night frost, its causes and prevention.] *Norway. Landbruksdirektøratet, Årsberetning*, **1928.** 98 p. 28 figs., 11 tables, 60 refs. Abstracted from reprint. **DLC**—A quantitative study of the effects of vegetation, height above ground, humidity, time of day (or night), radiation, cloudiness and other factors on the temperature in or around plants, with many examples cited and data presented in graphical and tabular form. Methods of protection by use of screens, smoke or chemical fogs are reviewed—especially those employed in this study and elsewhere in Scandinavia. The radiative balance of vegetation in the presence or absence of artificial screens, etc. is calculated. *Subject Headings:* **1. Radiation frosts 2. Frost prevention 3. Radiation balance 4. Scandinavia.**—*M.R.*

4C–145 551.524.37:551.509.532(479)

*§Kartsov, V. A., **Pervyĭ oblastnoĭ moroz v severo-zapadnom Predkavkaze.** [First regional frost in northwestern Caucasus.] *Zhurnal Geofiziki i Meteorologii*, 5(4):271–294, **1928.** 15 figs., 3 tables, refs. French summary. **DLC**—A careful analysis of frost conditions in northwestern Caucasus showed that Rostov-on-Don can be used as a representative point for the analysis of the regime of early autumn frosts in the area. Three types of synoptic situations with northerly and northwesterly invasions of cold air masses cause the early frosts in the area. The first frosts in Ufa and Smolensk precede the appearance of frost in Rostov-on-Don with probability not less than 85–90% and first frosts in the autumn at Vologda, Viatka and Perm precede by not less than four days the first frost in the Northern Caucasus. *Subject Headings:* **1. Autumn frosts 2. Synoptic conditions for frost 3. Frost forecasting 4. Rostov-on-Don, U.S.S.R. 5. Caucasus, U.S.S.R.**

4C–146 551.524.37(431/5):551.509.532

Kessler, Otto Wilhelm, **Fröste und Frostbekämpfung im Weinbau.** [Frost and frost protection in vineyards.] *Hessische Lehr- und Versuchsanstalt für Wein- und Obstbau, Oppenheim, Mitteilungen.* [1927]. 46 pp. tables, charts. **Part II** (reprint from Nos. 33, 43, 44, 45, 46 and 47, Weinfach-Zeitschrift, "Der Deutsche Weinbau," 1928, Karlsruhe), Karlsruhe, Ferd. Tiergarten, [1928]. 69+30 p. charts, fold. map. figs., tables, eqs. **DWB**—In Part I, the synoptic and topographic conditions associated with frost, the need for and methods of frost forecasting, and protective measures against frost, in vineyards are discussed. Pt. II consists of four chapters dealing with frost protection insurance, theoretical bases of protective measures, and the actual operation of the frost protection system in Oppenheim during 1928. *Subject Headings:* **1. Frost forecasting 2. Vineyards 3. Synoptic conditions for frost 4. Frost protection 5. Oppenheim, Germany.**—*M.P.K.*

4C–147 551.524.37(479)

§Shirkina, P. A., **Sinopticheskie usloviia sil'nykh kholodov na Kavkaze.** [Synoptic conditions for severe cold spells in the Caucasus.] *Zhurnal Geofiziki i Meteorologii*, 5(2):155–172, **1928.** 14 figs., 3 tables, 2 refs. **DLC**—A study of synoptic conditions during occasional spells of cold weather in Caucasus. Two hundred and fifty occurrences of very low temperature in Caucasus during 1890–1915 and 1924–1927 were analyzed. *Subject Headings:* **1. Frost forecasting 2. Synoptic conditions for frost 3. Caucasus, U.S.S.R.**

1929

4C–148 551.524.37:551.509.532

Allen, Charles C., **The fruit-frost work of the Weather Bureau in the upper San Joaquin Valley.** *Monthly Weather Review*, 57(10):424–425, Oct. **1929.** **DLC**—Heating for protection against frost damage is practiced in the more important fruit-growing districts of California. The author describes the fruit frost service established during recent years by the local office of the Weather Bureau. *Subject Headings:* **1. Fruit Frost Service 2. Frost protection 3. San Joaquin Valley, Calif.**

4C–149 551.524.4 551.524.37

Dyke, Ray A., **Nocturnal temperature inversions near the Gulf Coast.** *Monthly Weather Review*, 57:500–502, Dec. 1929. 2 tables, 4 refs. **DWB**—Differences in temperature between the New Orleans Weather Bureau Office and other locations in and around New Orleans, during anticyclonic conditions favorable for nocturnal inversions or frost are analyzed according to sky and wind conditions, and comparisons made with inversion data from kite station at Groesbeck, Texas, and Houston station and FLOYD YOUNG's data for Medford, Ore. *Subject Headings:* **1. Temperature inversions 2. Urban influences 3. Radiation frosts 4. Gulf Coast 5. New Orleans, Louisiana.**—*M.R.*

4C–150 551.524.37:551.582(8)

*Reed, Wesley Wharton, **Climatological data for southern South America.** *Monthly Weather Review, Supplement*, No. 32, 1929. 23 p. 35 tables, refs. **DWB**—The author describes climatic conditions of the area, presents many tables of data and discusses frost. In Paraguay the reading of 32°F or slightly lower temperatures has been noted at all stations except Asuncion. In Uruguay minimum temperatures slightly below 25°F were recorded in all regions. In Chile freezing temperatures occur along the coast from Valdivia southward and at nearly all of the inland stations except in the extreme north. The extreme minimum temperatures recorded for the entire country are −2°F at Lonquimay (3182 ft) and 9°F at Potrerillos (2789 ft). The number of frost days, "minimum temperature of 32°F or lower, are practically unknown in the extreme northern littoral region of Argentina; over the remainder of the country the mean annual number of such days ranges from 10 to 44 (Azul) in the southern littoral region, from 8 to 81 (Cipolleti) in the Mediterranean region, from 9 to 169 (La Quiaca) in the Andean region and from 35 to 123 (Colonia 16 de Octubre) in the Patagonian region." (*Same item as* 3C–41, March 1952, *MAB.*) *Subject Headings:* **1. Frost data 2. Frost distribution 3. Climate of southern South America 4. Paraguay 5. Uruguay 6. Chile 7. Argentina.**

4C–151 551.524.37:551.584.3

Schmidt, Wilhelm, **Meteorologische Feldversuche über Frostabwehrmittel.** [Meteorological field experiments on frost protection.] *Austria. Zentralanstalt für Meteorologie und Geodynamik, Jahrbuch*, Anhang, 1927, 1929. 103+p. 5 plates, 21 figs., 5 tables, refs. **DA**—A comprehensive microclimatic study on distribution of air temperatures near the ground in relation to weather situation, topographic peculiarities, radiation conditions and soil temperature. The author presents a complete description of equipment and methods used in investigations. Effectiveness of different kinds of frost protection (smoke, covers, etc.) is discussed. *Subject Headings:* **1. Local frost conditions 2. Frost protection 3. Microclimatology.**

1930

4C–152 551.524.37

Foss, Haakon, **Nattefrost.** [Night frost.] *Naturen*, Bergen, 54(6):181–195, June 1930. 7 figs. **DLC**—A description of weather conditions conducive to the formation of night frosts. The author also analyzes day and night variations of air temperature during cold periods and describes methods of frost damage prevention. *Subject Headings:* **1. Radiation frosts 2. Frost prevention 3. Norway.**

4C–153 551.524.37:551.555.6(47)

§*†Gedeonov, A. D., **Vozvraty kholodov v mae v Leningradskoĭ Oblasti.** [Cold waves in May in the Leningrad Province.] *Trudy po Sel'skokhoziaĭstwennoĭ Meteorologii*, Leningrad, 22:93–113, 1930. 6 maps, 9 tables, 13 refs. English summary p. 112–113. **DLC**—This study is based on observations at 23 stations during 1898–1927. The author investigates synoptic weather types during these cold waves, and establishes their frequency. Each type of cooling is examined separately. Frost damage to vegetation occurs when cooling duration is more than one day. Spring cooling also shortens the growing period. *Subject Headings:* **1. May frosts 2. Frost damage 3. Synoptic conditions for frost 4. Leningrad Region, U.S.S.R.**

4C–154 551.509.532

Nichols, Esek S., **Predicting minimum temperature, especially as a function of preceding temperature.** *Monthly Weather Review*, 58(5):179–189, May 1930. 8 figs., 13 refs., eqs. Discussion by F. D. Young. *See also ibid.*, 54(12):499–501, Dec. 1926. **DLC**—This comprehensive study contains the following: Predicting of night frost from the evening dew point observation; hygrometric formula and graphs; transformation of hygrometric formula and curve into a formula for temperature prediction; comparison of dew point and temperature effects in hygrometric formula and graphs and a system of forecasting based on preceding temperature observations. In the

supplement the application of the maximum-minimum method in Southern Alabama is described. *Subject Headings:* **1. Minimum temperature forecasting 2. Frost forecasting formulas. I. Young, Floyd D.**

4C–155 551.524.37(431/5)

*Reichel, E., **Der jährliche Gang der Frost- und Kältenhäufigkeit im Norddeutschen Flachlande.** [The annual variation of frost frequency in the north German plain.] *Meteorologische Zeitschrift*, 47(6):215–222, June **1930.** 3 figs., 3 tables, 3 refs. **DWB**—A study of frost conditions in northern Germany based on observations at 13 meteorological stations during 1881–1925. *Subject Headings:* **1. Frost frequencies 2. Northern Germany.**

4C–156 551.524.37:551.524.1(4)

Schmidt, Wilhelm, **Die tiefsten Minimumtemperaturen in Mitteleuropa.** [The lowest minimum temperatures in Middle Europe.] *Naturwissenschaften*, 18(17):367–369, April 25, **1930.** ref. 3 figs. **DWB**—The lowest temperature (−48°C) was recorded in the vicinity of the biological station Lunz am See (Lower Austria) in February 1929 and 1930. The author gives data on the microclimatic distribution of temperature in this region. *Subject Headings:* **1. Extreme minimum temperature 2. Lunz am See, Austria.**

4C–157 551.524.37:551.525.5(73/9)

*Sourwine, J. A., **Method of analysis of data on frost occurrence for use in highway design.** *U. S. Dept. of Agriculture, Public Roads*, 11(3):51–60, May **1930.** 9 figs., refs. **DWB**—Study on the relationship between minimum temperatures in air and in soil. Author establishes critical lowest monthly minimum for objectionable ground freezing (as factor important for the design of public roads), and discusses frost conditions in the United States on the basis of observations made at 35 selected Weather Bureau stations. The relations between air temperatures and ground freezing are shown on diagrams and maps. *Subject Headings:* **1. Frost intensity 2. Highway design 3. Soil freezing 4. United States.**

4C–158 551.524.37:551.582.2(899)

*Uruguay. Instituto Meteorologico Nacional, **Datos del Observatorio Central Montevideo.—Rio de la Plata. Puerto de Montevideo . . . 1906–1929.** [Data from the Observatorio Central, Montevideo.—Rio de la Plata. Puerto de Montevideo . . . 1906–1929.] [Montevideo, 1910–**1930.**] 21 v. diagrs. on 4 fold. pl. and atlas. **DPU**—For the Central Observatory, monthly averages are shown for temperature in shelter, open air temperature, vapor pressure, relative humidity, cloudiness, wind, evaporation, insolation and days per month with fog, hail, frost, etc. The data are also presented diagrammatically. (*Same item as* 3C–111, March 1952 *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Climatic data 3. Montevideo, Uruguay. I. Bazzano, Hamlet.**—*M. L. R.*

1931

4C–159 551.524.37:551.553.11

Ellison, Eckley S., **Air drainage and formation of frost.** *American Meteorological Society, Bulletin*, 12(8–9):147–148, **1931.** **DLC**—Author's abstract and discussion at meeting of American Meteorological Society at Pasadena, June 17 to 19, 1931. Investigation of warm and cold air flow in small and large valleys and conditions important for frost formation. *Subject Headings:* **1. Frost pockets 2. Microclimatology 3. Air drainage.**

4C–160 551.524.37:551.521.2:551.584.41

Falckenberg, G., **Muldenfrost und Frostflächen in Waldlichtungen.** [Frost pockets and spots in clearings.] *Meteorologische Zeitschrift*, 48(1):22–25, Jan. **1931.** diagrs., refs. **DWB**—An apparatus was devised by the author to measure radiative temperatures of sky sectors of different angular dimensions (from the zenith) under conditions such as prevail in nature when frost occurs in concave pockets or clearings in the woods. It was found that the lowest sky temperature occurs near the zenith, and that with zenith temperature of −10°C, walls of a hollow, or trees below an angle of 45° radiate at a temperature above freezing. This indicates the optimum size of a clearing and distance from the edge of the timber (or hollow) in which frost is most likely to occur. *Subject Headings:* **1. Frost pockets 2. Radiation balance 3. Sky radiometers.**—*M. R.*

4C–161 551.524.37

Kirov, Kiro T. and Evtimov, Kr., **"Rezhim't" na mrazovitite dni v B'lgaria.** [Regime of frost days in Bulgaria.] (In: Bulgaria. Institut na Meteorologiata, **Kalendar 1931.** [Yearbook 1931.] Sofia, D'rzhavna Pechatnitsa, **1931.** p. 101–132. 3 tables.) **DLC**—Detailed analysis of frost conditions, frost frequency and of weather situations important for the formation of late spring and early autumn frosts. *Subject Headings:* **1. Frost frequencies 2. Bulgaria.**

4C–162 551.524.37:551.582(71)

*Koeppe, Clarence Eugene, **The Canadian climate.** Bloomington, Ill., McKnight and McKnight, **1931.** 280 p. maps, figs., tables, refs. **DLC**—A complete study of climate. Contains numerous items on frost (synoptic situations important to frosts, frost frequency, etc.) throughout Canada. Frost data for selected stations and average length of frost-free periods are shown on diagrams on p. 46. *Subject Headings:* **1. Frost frequencies 2. Frost free periods 3. Climate of Canada 4. Canada.**

4C–163 551.524.36 551.521.32

Linke, Franz, **Die nächtliche effektive Austrahlung unter verschiedenen Zenitdistanzen.** [Nocturnal effective radiation under various zenith distances.] *Meteorologische Zeitschrift*, 48(1): 25–31, **1931.** 2 figs., 14 refs. **DLC**—Sensitive actinometers with thermopiles or bolometers with mirror galvanometer are suitable instruments for measuring outgoing radiation from inclined surfaces or free surfaces of any form or for altitude angles between 0° and 90°. The method for determining the aperture angle of the actinometer and the method for measuring both solar and sky light are discussed. The dependence of outgoing radiation upon pressure of absorbing gases in the atmosphere including water vapor and ozone and the vertical temperature gradient of the atmosphere is determined both by observational data and theoretical considerations. Expressions are derived for determining effective outgoing radiation from a vertical surface and from a sphere and vertical cylinder. *Subject Headings:* **1. Nocturnal cooling 2. Outgoing radiation 3. Actinometers.**—*I. L. D.*

1932

4C–164 551.524.37(435)

Bender, Kurt, **Die Frühjahrfröste im Unterelbgebiet und ihre Bekämpfung.** [Spring frosts in the Lower Elbe region and their prevention.] *Das Wetter*, 49(2):39–51, Feb. **1932.** 2 figs., 4 refs. **DWB**—Special investigation of spring frosts and their variations with different forms of surface. Method of frost forecasting and prevention of frost damage presented. *Subject Headings:* **1. Spring frosts 2. Lower Elbe Region, Germany.**

4C–165 551.524.37(931) 551.578.4(931)

Kidson, E., **The frequency of frost, snow and hail in New Zealand.** *New Zealand Journal of Science and Technology*, 14(1):42–54, Aug. **1932.** 8 figs., refs. **NNA**—Geographical distribution due mainly to topography and location, and monthly frequencies of frost, discussed and shown on schematic charts. Number of days per annum with minimum temperatures below freezing, number of days of snow and hail per annum and annual distribution of hailstorms and snowfall are discussed and charted. *Subject Headings:* **1. Frost frequencies 2. Hail 3. Snow 4. New Zealand.**—*H. P. K.*

4C–166 551.524.37

Talman, Charles F., **Jack frost in Florida.** *American Meteorological Society, Bulletin*, 13(5):103–104, May **1932. DLC**—Brief description of two types of frosts destructive to citrus groves in Florida. One type is due to local conditions, the other so called "Frost of cold waves" is a result of a widespread atmospheric disturbance and is usually accompanied by considerable wind speed. *Subject Headings:* **1. Frost damage to citrus orchards 2. Cold waves 3. Florida.**

4C–167 551.524.37:551.582(94,931)

*†Taylor, T. Griffith and Kidson, Edward, **1. Climatology of Australia** (by G. Taylor). **Climatology of New Zealand** (by E. Kidson). (In: **Köppen-Geiger Handbuch der Klimatologie.** v. 4, Pt. S. Berlin, **1932.** 137 p. figs., tables, refs.) **DWB**—A brief description of frost conditions is given on p. 16 for Australia and on p. 125 for New Zealand. For New Zealand frost data for five stations of the country are presented in table 14 (p. 133). *Subject Headings:* **1. Frost frequencies 2. Climate of Australia 3. Climate of New Zealand 4. Australia 5. New Zealand.**

1933

4C–168 551.524.37:551.582(51)

*Chapman, Burgoyne B., **The climatic regions of China.** *Nanking. University. College of Agriculture and Forestry, Bulletin, New Ser.*, No. 3, March **1933.** 77 p. 16 figs., 13 maps, 7 tables, refs. **DWB**—A description of frost conditions can be found in the first part. Table 3 contains temperature data by regions for 92 stations of China; including median date of last and first frosts, average number of frost-free days, number of days safe from frost and recorded lowest minimum of air temperature. *Subject Headings:* **1. Frost frequencies 2. Frost free period 3. Extreme minimum temperature 4. Climate of China 5. China.**

4C–169 551.524.37:551.506.3:634.8

*†Zahn, Heinrich, **Untersuchungen über Spätfrostschäden an der Rebe.** [Investigations of late frost damage to grape vine.] *Die Gartenbauwissenschaft*, 6(4):1–66, [1933]. 15 figs., tables, 40 refs. **DA, DWB**—On the basis of earlier investigations carried out by BASSERMAN-JORDAN, SCHÜBLER and others, the author presents a complete analysis of late spring frosts, chiefly for Bavaria. Two tables of spring frost frequency during the period 1434–1825 show 97 late spring frosts and 61 cases of winter frost damage recorded in about 400 years (1455–1830). The extreme date of late frost for the period 1434–1820 was June 3, 1805. Daily minimum temperature data for April–May 1909–1928 indicate a great variability of duration of frost periods. The author also describes the frost damage in the country and its influence on the quality of grapes, and analyzes the peculiarities of advective and radiation frost in connection with local microtopography. *Subject Headings:* **1. Spring frosts 2. Frost frequencies 3. Long period records 4. Vineyards 5. Microclimatology 6. Bavaria, Germany.**

1934

4C–170 551.524.37:634.94

Day, William Robert and Peace, T. R., **The experimental production and the diagnosis of frost injury on forest trees.** *Oxford Forestry Memoirs*, No. 16, **1934.** 60 p. 53 figs., tables, graphs, 78 refs. **DLC**—The literature on artificial production of frost damage to various deciduous and evergreen trees is reviewed. The results of experiments carried out on small trees in pots (*Larix, Pinus, Picea, Pseudotsuga, Thuja, Fagus* and *Quercus*) and experimental procedure, and the nature of the frost damage to the tissues are discussed. Susceptibility to frost increases during spring, is at maximum during the summer and declines in autumn to a winter minimum. A table giving the critical temperature for spruce at different periods of the year is given. The variations in susceptibilities of various species is discussed and the nature of the frost damage to the tissues is described and illustrated. *Subject Headings:* **1. Frost damage to forests 2. Forestry.**—*I.L.D.*

4C–171 551.524.37(64)

Debrach, Jean and Bidault, G., **Les gelées nocturnes sur le littoral marocain.** [Night frosts on the Moroccan coast.] *Association Française pour l'Avancement des Sciences, Compte Rendu*, 58:88–97, **1934.** 2 figs., 4 tables, 8 refs. **NN**—General discussion of night frosts in Morocco including consideration of nocturnal cooling, influence of cloud cover and air temperature and humidity conditions, forecasting of low temperatures, and the influence of general synoptic situations, several of which are illustrated. Tables give means and frequencies of temperature minima at Casablanca for the last 10 years. (*Same as* 3A–144, Jan. 1952, *MAB.*) *Subject Headings:* **1. Radiation frosts 2. Synoptic conditions for frost 3. Morocco.**—*H.P.K.*

4C–172 551.524.37:551.582(64):551.586(64)

Emberger, Louis and Marie, R., **Tableau phytogéographique du Maroc.** [Phytogeographic sketch of Morocco.] *Société des Sciences Naturelles du Maroc, Mémoires*, No. 38, May **1934.** 187 p. 16 figs., tables, refs. **NNM**—A thorough exposition on Moroccan climate (p. 36–171). Each element is analyzed in turn. Contents include chapters on: wind, rainfall and snow, radiation and temperature, annual monthly and seasonal means and variations, and frosts; and humidity and evaporation—including consideration of relative humidity, vapor pressure, cloud, fog and mist, saturation deficit, and some evaporation discussion and data. Effects of each element on vegetation conditions are considered. (*Same item as* 3A–146, Jan. 1952, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Climate of Morocco 3. Plant ecology 4. Morocco.**—*H.P.K.*

4C–173 551.524.37 551.584

*Geiger, Rudolf, Woelfle, M. and Seip, L. Ph., **Höhenlage und Spätfrostgefährdung. Ergebnisse meteorologischer Messungen im Frühjahr 1931 und 1932 am Grossen Arber, Bayer. Wald.** [Altitude and late frost hazard. Results of meteorological measurements in spring 1931 and 1932 in Grosser Arber, Bavarian Forest.] *Forstwissenschaftliches Zentralblatt*, Berlin, 55(17, 21):579–592, 739–746, Sept., Nov. **1933**; 56(5, 7, 8, 14):141–151, 222–230, 253–260, 466–484, March, April, July **1934.** figs., tables, refs. **DWB**—These papers describe and give the results of a series of carefully designed studies carried out in the Grosser Arber in the Bavarian Forest during the spring of 1931 and 1932 in order to determine the relationship between time of occurrence and intensity of late frosts and altitude up to 800 m above the valley floor (1447 m above sea level). One hundred and twenty minimum thermometers, placed at intervals that averaged 15 m, were used. The investigations covered the following: air mass characteristics of the Arber during the spring; vertical temperature distribution according to the observations of the five principal weather stations; diurnal temperature variation in May and June; meteorological conditions associated with radiation and advective frost; decrease of absolute humidity with height; diurnal variation of absolute humidity;

decrease of relative humidity with height and its daily variation; wind conditions at the main weather stations; temperature and phenological observations in the Geigenbach valley including the relationship between temperature inversions, air masses and wind, and the distribution of night temperature in relatively warm air areas and frost threatened localities. *Subject Headings:* **1. Forest meteorology 2. Microclimatology 3. Phenology 4. Vertical frost distribution 5. Bavarian Forest, Germany.**—*I.L.D.*

4C–174 551.509.532(52)

Huzita, K., **On the construction of minimum temperature formulae and their application to Gifu district especially on frosty night.** *Meteorological Society of Japan, Journal, 2nd Ser.*, 12(3): 146–155, **1934.** 3 figs., refs., 6 eqs. In Japanese, English summary p. 146. **DLC**—The author studied the hygrometric formulas of ELLISON and others, used data recorded at Gifu, and developed an equation for minimum temperature prediction. Investigations made for Japan and their applicability to the Gifu district are discussed. *Subject Headings:* **1. Minimum temperatures 2. Hygrometric frost formulas 3. Gifu, Japan.**

4C–175 551.524.37:551.584.31(431/5)

Landsberg, Helmut and Müller, H., **Versuche zur Frostbekämpfung im Reingau.** [Attempt at frost prevention in the Rhine region.] *Wein und Rebe*, Mainz, 16(6):178–191, Oct. **1934.** 7 figs. **DWB**—Late spring frosts covered the Rhine region during an advection of cold air masses in or near an area of high pressure and caused great damage to vineyards. The advective nature of frosts makes the problem of frost protection a very difficult one. The authors give a description of topographic features and thermometer installations used in serial experimental investigations made since 1931. The distribution of isotherms for several cases of frost, with preventive measures (two types of heating) and without them, are shown on charts. *Subject Headings:* **1. Spring frosts 2. Frost pockets 3. Frost prevention 4. Vineyards 5. Microclimatology 6. Rhine Valley, Germany.**

4C–176 551.524.37(57)

*†Mirotvortsev, K. N., **Klimat Vostochno-Sibirskogo Kraia.** [Climate of East Siberia District.] Irkutsk, **1934.** 217 p. 8 maps, tables, 61 refs. **DLC**—On pp. 13–15 the author presents a brief analysis of frost conditions in Eastern Siberia (extreme and mean minimum temperatures of the air, duration of frost period). In Chap. 8, entitled "Klimaticheskaia kharakteristika administrativnykh raĭonov kraia" (p. 93–164), data of days with frost in summertime and duration of frost-free periods for each of 63 regions are given. *Subject Headings:* **1. Climate of Eastern Siberia 2. Frost frequencies 3. Frost free period 4. Eastern Siberia, U.S.S.R.**

4C–177 551.509.532

Topol'nitskiĭ, Nikolaĭ M., **Opyt provedeniia raĭonnoĭ sluzhby preduprezhdeniia zamorozkov.** [Attempt at a regional frost warning service.] *Klimat i Pogoda*, 10(6):7–8, **1934.** 2 eqs. **DWB**—Report on special temperature observations and experimental warning service, which were made during spring 1934 in one district of the Moscow Area. *Subject Headings:* **1. Frost warning services 2. Moscow, U.S.S.R.**

1935

4C–178 551.509.532

Andrews, R. T., **Nocturnal cooling and the prediction of night minimum temperature.** *Meteorological Magazine*, London, 70(832):90–91, **1935.** table, 2 refs. **DLC**—The author presents a formula for predicting minimum screen temperatures on winter nights at Abbotsinch, Renfrewshire, which is based on observations from Sept. 1933 to April 1934. The formula is: $T-M=0.4(T-D)+0.35T-4.5$, (T—temperature in screen at 15–16h, M—minimum temperature in screen, D—dew point). *Subject Headings:* **1. Nocturnal cooling 2. Minimum temperature forecasting 3. Abbotsinch, Scotland.**

4C–179 551.524.37(58)

*Babushkin, L. N., **Zamorozki v iuzhnykh raĭonakh Sredneĭ Azii.** [Frosts in the southern regions of Central Asia.] *Sovetskie Subtropiki*, Moscow, 2(10):50–54, Oct. **1935.** 5 tables. **DLC**—Some remarks on differences between minimum air temperatures in the screen and in the layer near the ground. The author divides all frosts observed in S. Central Asia into 2 classes—slight and severe ones, and presents tables of their frequency. *Subject Headings:* **1. Frost intensity 2. Frost frequencies 3. Central Asiatic U.S.S.R.**

4C–180 551.509.532

Benashvili, I. A., **K voprosu o metodike predskazaniia zamorozkov.** [Frost forecasting methodology.] *Sovetskie Subtropiki*, Moscow, 2(10):76–78, Oct. **1935.** table. **DLC**—A report on the

results of the verification of KAMMERMANN's method of frost forecasting in Azerbaĭdzhan. This method, if used with KOROSTELEV's correction, can give an 85% accurate forecast. Special reduction values developed for 7 basic points of the area are presented. *Subject Headings:* **1. Frost forecasting 2. Forecast verification 3. Kammermann's formula 4. Azerbaĭdzhan, U.S.S.R.**

4C–181 551.524.37(821)

*De Fina, Armando L., **Las heladas primaverales en Buenos Aires durante el periodo 1909–1933.** [Spring frosts in Buenos Aires during 1909–1933.] *Revista Argentina de Agronomia*, Buenos Aires, 2(6):57–77, Aug. **1935.** 4 graphs, 5 tables, 13 refs. **DA**—A study made of spring frosts in the city of Buenos Aires based on data from the meteorological observatory of Villa Ortuzar. Data are analyzed for 5-day periods and combined for 10-, 15-, and 20-day periods for the benefit of orchardists and florists. Frost intensity is classified into 4 types (0°, −2°, −4°, −6°) and 20-year period is calculated. In 25 years no frost was registered after Dec. 1. Daily observations taken at the surface and at 10 cm above the surface show average and absolute minimum temperatures from Aug. 1 to Nov. 30, number of observations of frost at 0° and −4° and a summary for each class. Data are shown in graphs and tables. (*Same item as* 3C–159, March 1952, *MAB.*) *Subject Headings:* **1. Spring frosts 2. Frost intensity 3. Buenos Aires, Argentina.**—*M.L.R.*

4C–182 551.524.37(57)

Kram, K. M. and Ostanin, A. M., **Resul'taty ispytaniia selektsionnykh sortov zerna.** [Results of testing selected grain types.] *Sotsialisticheskoe Stroitel'stvo Buriato-Mongolii*, No. 2:44–50, **1936.** Review in: *Ulan-Ude, U.S.S.R. Buriato-Mongol'skiĭ Gosudarstvennyĭ Nauchno-issledovatel'skiĭ Institut, Bibliografiia Buriato-Mongolii*, 3:248, **1946. DLC**—Description of soil, geographical and climatic conditions of Eastern Siberia. Results of special agricultural and meteorological observations are given. *Subject Headings:* **1. Frost effects on plants 2. Eastern Siberia, U.S.S.R.**

4C–183 551.509.532(584)

Murzin, A., **Ispytanie formuly Mikhalevskogo v usloviiakh Ashkhabada.** [Verification of Mikhalevskiĭ's formula in Ashkhabad.] *Klimat i Pogoda*, 11(2):6, **1935.** 2 figs., 7 tables. **DLC**—Report on the verification of MIKHALEVSKIĬ's formula (1926). The author concludes that this formula can be used for frost forecasting in the Ashkhabad region. *Subject Headings:* **1. Frost forecasting 2. Mikhalevskiĭ's formula 3. Turkistan, U.S.S.R.**

4C–184 551.524.37:551.509.532(54)

*Ramdas, L. A., **Frost hazard in India.** *Current Science*, Bangalore, 3(8):325–333, Feb. **1935.** 7 figs., 4 tables, refs. **DLC, DWB**—The characteristics of frost conditions based on data up to 1920 (mean and extreme minimum temperatures), frequency of radiation minimum during 10 years (1920–1929) with distribution with height (from soil surface to 3 ft), are presented and discussed. The author analyzed the possibilities of frost prediction and frost protection. *Subject Headings:* **1. Frost hazard 2. Frost forecasting 3. Frost protection 4. India.**

1936

4C–185 551.509.532

*Bandorina, A. K., **Proverka metodov predskazaniia zamorozkov.** [Verification of methods of frost prediction.] *Klimat i Pogoda*, 12(3):29–32, May **1936.** 5 tables, eqs. **DWB**—Two methods of night frost forecasting, presented by ÅNGSTRÖM and MIKHALEVSKIĬ, were investigated on the basis of long period observations (1921–1930) made by the meteorological stations Kamennaia Step' No. 2 and No. 4 (Voronezh Province). Better results were obtained with ÅNGSTRÖM's formula which permits the application of observations at 1 p.m. *Subject Headings:* **1. Frost forecasting 2. Angström's formula 3. Mikhalevskiĭ's formula 4. Forecast verification 5. Voronezh Province, U.S.S.R.**

4C–186 551.524.37(479)

*§Bel'skiĭ, N. I., **Rezkie kolebaniia temperatury na Chernomorskom poberezh'i Kavkaza, soprovozhdaiushchiesia morozami.** [Rapid changes of temperature on the Black Sea Coast of Caucasus accompanied by frosts.] *Leningrad. Agrogidrometeorologicheskiĭ Institut, Materialy po Agroklimaticheskomu Raĭonirovaniiu Subtropikov SSSR*, No. 1:76–125, **1936.** 45 maps, 5 tables. **DLC**—A comprehensive synoptic analysis of frost conditions on the sea coast of the Caucasus. The author discerns two principal types of synoptic situations during these frosts: 1) when the advection of cold air waves comes from the sea and is accompanied by northerly and northwesterly winds, and 2) when the air flow reaches the coastal line coming from over the mountain range and is accompanied by northeasterly winds. A list of frosts in the Sochi-Batum area for the period 1882–1932 is attached. *Subject Headings:* **1. Synoptic conditions for frost 2. Frost frequencies 3. Caucasus, U.S.S.R.**

4C–187 551.524.37:551.506.3(479)

*Butskiĭ, P. A., **Kompleksnaia kharakteristika morozov Zapadnogo Zakavkaz'ia.** [Complex character of frosts in Western Transcaucasus.] *Leningrad. Agrogidrometeorologicheskiĭ Institut, Materialy po Agroklimaticheskomu Raĭonirovaniiu Subtropikov SSSR*, No. 1:224–233, **1936.** 2 tables, refs. **DLC**—Characteristics of air temperature, wind velocity, cloudiness and relative humidity during the frost period. Tables of "complex analysis" of frost, based on 25 years of observation (1905–1930), were prepared according to E. E. Fedorov's method. *Subject Headings:* **1. Frost frequencies 2. Long period records 3. Caucasus, U.S.S.R.**

4C–188 551.524.37(42)

Champion, Donald L., **Spring frost and fruit crops.** *Meteorological Magazine*, London, 71(846): 129–133, July **1936.** 3 figs., tables, 3 refs. **DLC**—The widespread damage to fruit and other trees, caused by the severe frost of May 1935 in England incited the author to make special observations during the spring of 1936 in order to ascertain how far above the surface the so called "ground" frost can extend. Observations show, in extreme cases (screen minimum of 33°F), a "ground" frost at heights exceeding 10 ft above soil surface, therefore the correct term for it would be "crop frost." In cases when screen temperature is likely to fall below 35°F, fruit crops should be protected. *Subject Headings:* **1. Spring frosts 2. Vertical frost distribution 3. Frost damage to orchards 4. Microclimatology.**

4C–189 551.524.37(434)

*Dieckman, A., **Zur Kenntnis der Frostverhältnisse im Schwarzwald.** [On the problem of frost conditions in the Black Forest.] *Zeitschrift für angewandte Meteorologie*, 53(10):332–336, Oct. **1936.** 2 tables. **DWB**—Analysis of frost conditions and their frequency, based on long-period observations (1895–1935) in Höchenschwand (1005 m above sea level) and in Donemeschingen (692 m above sea level). *Subject Headings:* **1. Frost frequencies 2. Black Forest, Germany.**

4C–190 551.524.37(479)

§Duletova, T. A. and Barsuk, Z. E., **K voprosu o morozakh v Zapadnoĭ Gruzii.** [On the problem of frost in Western Georgia.] *Leningrad. Agrogidrometeorologicheskiĭ Institut, Materialy po Agroklimaticheskomu Raĭonirovaniiu Subtropikov SSSR*, No. 1:126–149, **1936.** 12 figs., 3 tables, 12 refs. **DLC**—Synoptic analysis of frost conditions and analysis of duration and intensity of this phenomenon. Frost occurs in western Georgia when cold air masses come from the Barents and the Kara Seas. *Subject Headings:* **1. Frost intensity 2. Frost frequencies 3. Synoptic conditions for frost 4. Georgia, U.S.S.R.**

4C–191 551.509.62:634.8

Huber, H., **Diesjährige Erfahrungen mit wasserdichten Papier-Frostschirmen.** [This year's experience with waterproof paper frost screens.] *Schweizerische Zeitschrift für Obst- und Weinbau*, Wädenswil, 45(17):320–321, Aug. **1936.** **DA**—Paper screens require less storage space than straw screens. They were used to protect vines. Under conditions at which temperatures fell below −2° and −2.5°C and rime formed, grapevines protected by waterproof paper screens were green and showed no evidence of frost. If kept dry, the screens can be used 2 to 3 times. *Subject Headings:* **1. Frost protection 2. Protective screens 3. Vineyards 4. Switzerland.**—*I. L. D.*

4C–192 551.524.37(74)

Janofsky, Jack, **Wind and minimum temperature in the Redlands, California, fruit-frost district.** *Monthly Weather Review*, 64(10):325–329, Oct. **1936.** fig. 3 tables, 2 refs. **DLC**—A special study on the importance of wind in night frost formation. The author shows in numerous examples a relation between minimum temperature and wind, and analyzes various weather conditions associated with frost formation. *Subject Headings:* **1. Radiation frosts 2. Wind effects on minimum temperatures 3. Redlands, Calif.**

4C–193 551.509.532

Kul'ganovskiĭ, S., **O sposobe Siniavskogo dlia predskazaniia zamorozkov po nabliudeniiam na odnom punkte.** [Siniavskiĭ's method of frost forecasting based on observations at one point.] *Meteorologiia i Gidrologiia*, 1(10):77–78, Oct. **1936.** **DLC**—Discussion of a method of forecasting based on the evaluation of the combined effect of all meteorological factors. *Subject Heading:* **1. Frost forecasting.**—*C. K.*

4C–194 551.524.37(432.1):632.11

Kunze, G., **Das Nachtfrostproblem unter pflanzenphysiologischem Gesichtspunkt.** [The night frost problem from the point of view of plant physiology.] *Zeitschrift für angewandte Meteorologie*, 58(6):181–187, June **1936.** 2 figs. **DWB**—A review of night frost conditions (frequency,

intensity and distribution) in Saxony based on a 10-year period of observation, and analysis of the influence of frost on plants. *Subject Headings:* **1. Radiation frost 2. Frost effects on plants 3. Frost frequencies 4. Saxony, Germany.**

4C–195 **551.524.37(73)**

Lackey, Earl E., **Variability isocrymal maps for the Great Plains.** *Monthly Weather Review*, 64(3):71–76, March **1936.** 9 figs., 25 refs. **DLC**—These maps are based on median and percentile data for about 500 stations in 10 states. Average length of records is about 35 years, varying from 20 to 71. As a rule, stations with fewer than 20 years of observation were not used. These maps indicate the minimum number of consecutive days which were free from killing frost 20%, 50% or 80% of the time. *Subject Headings:* **1. Frost frequencies 2. Frost free period 3. Great Plains, United States.**

4C–196 **551.524.37(57):632.11**

Markin, V., **Vliianie letnikh zamorozkov na razvitie kul'turnykh rasteniĭ v usloviiakh vostochnoĭ Sibiri.** [Influence of summer frost on cultivated plants in Eastern Siberia.] *Narodnoe Khoziaĭstvo Vostochno-Sibirskogo Kraia*, Irkutsk, No. 3:60–66, **1936.** Review in: *Ulan-Ude, U.S.S.R. Buriato-Mongol'skiĭ Gosudarstvennyĭ Naucho-Issledovatel'skiĭ Institut Kul'tury, Bibliografiia Buriato-Mongolii*, 1890–1936, Irkutsk, 3:221, **1946.** **DLC**—The relation between the development of cultivated plants and frost duration and intensity is analyzed and results of special observations in Eastern Siberia presented. *Subject Headings:* **1. Summer frosts 2. Eastern Siberia, U.S.S.R.**

4C–197 **551.524.37(268)(98)**

*Pokrovskaia, Taisiia Vasil'evna, **Klimaticheskie dannye dlia severnogo morskogo puti za navigatsionnyĭ period.** [Climatic data for the northern sea route during the navigation period.] Leningrad, Izdat, Glavsevmorputi, **1936.** 75 p. 20 figs., 15 tables, refs. English summary p. 73–76. **DLC**—Characteristics of frost conditions during the summer (frequency of extreme minimum air temperatures and duration of frost free period) are given on p. 31–33. *Subject Headings:* **1. Frost frequencies 2. Frost free period 3. Northern sea route 4. Arctic coast of U.S.S.R.**

4C–198 **551.524.4**

Siegel, S., **Messungen des nächtlichen thermischen Gefüges in der bodennahen Luftschicht.** [Measurements of nocturnal thermal structure in the air layer near the ground.] *Beiträge zur Geophysik*, 47(1/2):369–399, **1936.** 18 figs., 11 refs. English summary p. 370. **DLC**—A thermoelectric apparatus for measuring the vertical temperature structure of the air near the ground at a large number of points is described in detail. It consists of a mast upon which 16 thermocouples are attached at intervals of 5, 25, 50 and 100 cm from 6–400 cm and these are connected with a mirror galvanometer. Five types of night vertical temperature distributions were determined: evening wind type, increasing cold air type, nocturnal secondary minimum type, nocturnal austausch type and meadow cloud type. The nocturnal vertical temperature structure is determined by intensity and character of the wind, and its effects consist of mass "austausch." In the case of mild winds the dust content of the lower layers influences the nocturnal cooling. The amount of existing inversion corresponding to various wind velocities is analyzed and for each velocity, except for very low velocities, the degree of inversion could be forecast. Many graphs are presented to show vertical temperature distribution, height of inversion, etc. Time sections show temperature of −6°C at ground from midnight to 6 a.m., when temperature at 4 m is −2°C. *Subject Headings:* **1. Vertical temperature gradient 2. Nocturnal cooling 3. Microclimatology.**—*I. L. D.*

4C–199 **551.524.37:551.509.532**

Veryard, R. G., **Nocturnal cooling and the prediction of night minimum temperature.** *Meteorological Magazine*, London, 71(843):69–71, April **1936.** fig., table, 3 refs. **DLC**—Brief summary and discussion of investigations made in India in 1934–1936. For the prediction of minimum screen temperatures in winter nights E. Gold presented the following formula: $T-M=0.4(T-D)+0.15T+5.5$. That is amount of cooling $(T-M)$ against the difference between the temperature (T) and the dew point (D). Later very similar relations were found for other points in India. *Subject Headings:* **1. Nocturnal cooling 2. Minimum temperature forecasting 3. India.**

4C–200 **551.524.37(797)**

*Young, Floyd D. and Baughman, Fred A., **Temperature survey of Kittitas County, Wash.** *Monthly Weather Review*, 64(5):159–168, May **1936.** 8 figs., 5 tables. **DLC**—Observations of the stations in Kittitas County during 1931–1935 were used for this survey. Author gives an analysis of frost conditions in the region (absolute and average minimum, number of hours with temperature 32° and lower, or 29° and lower). Last dates of killing frost in spring at Ellensburg, Wash., 1892–1935, are given in diagrams for comparison. *Subject Headings:* **1. Frost frequencies 2. Kittitas Valley, Washington.**

1937

4C–201 551.509.532

Boyden, C. J., **A method of predicting night minimum temperatures.** *Royal Meteorological Society, Quarterly Journal*, 63:383–392, **1937.** 5 figs., eqs. Discussion p. 389–392. **DWB**—The formula $T_2=\frac{1}{2}(T_1'+D)$, where T_2 is minimum dry bulb temperature; T_1' is maximum wet bulb temperature and D is dew point, is extended to forecast minimum temperatures at individual stations in England on nights where there is no appreciable change of air mass between the times of maximum and minimum temperature. Allowance is made for wind speed, cloudiness and fog formation. Discussion is to the effect that formula is too rigid for practical application. (*Same item as* 3E–32, May 1952, *MAB.*) *Subject Headings:* **1. Objective forecasting 2. Minimum temperature forecasting 3. England.**—*M.P.K.*

4C–202 551.509.532

Chalikov, KH. KH., **Predvychislenie nochnoĭ minimal'noĭ temperatury v vesennie i osennie periody.** [Computation for forecasting night minimum temperature in spring and autumn.] *Meteorologiia i Gidrologiia*, No. 8:67–76, Aug. **1937.** 6 tables, 7 refs., 12 eqs. **DLC**—The author analyzes the existing formulas for forecasting minimum temperatures, which do not give accurate results; by combining two of them (MIKHALEVSKIĬ's and ÅNGSTRÖM's) he works out a new formula which greatly improves the accuracy of these forecasts. *Subject Headings:* **1. Minimum temperature forecasting 2. Frost forecasting formulas.**—*C.K.*

4C–203 551.582:551.524.37:551.586.61:91(02)

***Mirovoĭ agro-klimaticheskiĭ spravochnik.** [The world's agroclimatic handbook.] Leningrad, Gidromet. Izdat., **1937.** 418 p. 17 figs., 9 tables, 251+56 refs. English summary p. 50–53. **DLC, DWB**—This important handbook has been prepared by the Agro-Hydrometeorological Institute (AGMI) under supervision of Prof. G. T. SELIANINOV. The methods for selecting the agricultural characteristics of climate and for the classification of the world's agro-climatic zones are discussed by G. T. SELIANINOV (p. 5–49). I. A. GOL'TSBERG explains the composition of the book in general. The authors pay special attention to the problem of frost and its distribution. Frost is classified into 5 groups as follows: 1) Tropical zone, which is actually a frost-free zone; 2) Subtropical zone, where frosts, as a rule, are occasional phenomena observed exclusively during the winter season; 3) Temperate zone, with air temperatures below the freezing point during winter and with night frosts in spring and autumn; 4) The polar zone, with night frosts occurring throughout the year, even in summer and 5) The last (fifth) arctic zone, with air temperatures below freezing point during the whole year. Collection of the world's material on frosts and its preparation for print has been made under the supervision of K. I. CHEPEGA. Complete agroclimatic data from more than two thousand stations, covering the whole globe, and based on long period observations (usually more than 25 years) are given in the first part of tables. These tables contain mean air temperatures of the warmest and coldest months, absolute and mean minimum of air temperature, annual amount of precipitation and duration of the frost-free and dry periods (mean and extreme data), characteristics of frost frequency and duration with air temperature above 5°, 10° and 15°C. Monthly and annual data of air temperature, precipitation, mean relative humidity, mean cloudiness and mean sunshine duration are presented in the next part of tables. *Subject Headings:* **1. Climatic data 2. Frost frequencies 3. World climate 4. Frost free period 5. Asia 6. Africa 7. North America 8. South America 9. Australia 10. Europe. I. Selianinov, G. T. II. Gol'tsberg, I. A. III. Chepega, K. I.**—*M.R.*

4C–204 551.506:551.524.36(64)

***Roux, Georges, Contribution à l'étude du climat du Maroc; les températures maxima et minima.** [Contribution to the study of climate of Morocco; maximum and minimum temperatures.] *Société des Sciences Naturelles du Maroc, Mémoires*, No. 44:17–57, Dec. **1937.** extensive tables. **NN**—Temperature data are tabulated for 29 stations in Morocco, which were selected for quality and duration of their observations with a minimum of 8 years. Work consists almost entirely of data, averaged, systematized and arranged comparatively. Introductory text stresses some of the inconsistencies, variations, inhomogeneities, etc. of the available data. (*Same item as* 3A–188, Jan. 1952, *MAB.*) *Subject Headings:* **1. Temperature data 2. Morocco.**—*H.P.K.*

4C–205 551.509.62:634.8

Sauberer, Franz, **Einige Untersuchungen über Nachtfrost und Frostschutz in Weingärten.** [Investigations into night frost and frost protection in vineyards.] *Meteorologische Zeitschrift, Bioklimatische Beiblätter*, 4(1):19–22, **1937.** table, refs. **DWB**—Measurements of radiation balance on bright nights show large heat losses in soils of poor heat conductivity and formation of a strong temperature inversion in the first 50 cm above the ground. Cloud layers, fire smoke and protection covers lower the eradiation considerably. Oil burners have a direct radiation effect of

only about 3 m, being within 1 m so strong as to harm the plant shoots. The air temperature to a height of 50 cm is measurably increased up to 4 m from the burner. *Subject Headings:* **1. Radiation frosts 2. Frost protection 3. Vineyards.**—*H. Landsberg.*

4C–206 551.524.37

Sauberer, Franz, **Über die Entstehung des Grasfrostes.** [On the origin of grass frost.] *Meteorologische Zeitschrift, Bioklimatische Beiblätter*, 4(4):174–177, **1937.** refs., tables. **DWB**—The nightly frost occurring on grass covers is termed "grass frost." As a result of low conductivity and evaporation, the grass cover cools more rapidly during the period of nocturnal radiation than bare ground or water. Since outgoing radiation depends upon the surface temperature there is less outgoing radiation above a grass cover than above other surfaces except snow or ice. The heat radiated by the grass cover is derived largely from the layers of air near the ground in contrast to the heat radiated by bare ground or water; hence, grass frost is formed. *Subject Headings:* **1. Grass frosts 2. Nocturnal cooling 3. Cover influences.**—*I. L. D.*

4C–207 551.509.532(02)

U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Vremennaia instruktsiia dlia predskazaniia zamorozkov po mestnym priznakam.** [Temporary manual for frost forecasting according to local signs.] Moscow, Gidromet. Izdat., **1937.** 16 p.+3 plates. **DWB**—Description of the usual methods of frost forecasting (BROUNOV's, LANG's, MIKHALEVSKIĬ's, KAMMERMANN's, MIKHEL'SON's, DONNEL-YOUNG, etc.) and instructions on how to use them at meteorological stations. *Subject Headings:* **1. Frost forecasting 2. Manuals.**

4C–208 551.582.2(73/9)

*U. S. Weather Bureau. Climatological Div., **Summaries of climatological data of the United States.** *U. S. Weather Bureau, Bulletin W.* 1st ed. 1912: 2nd ed. 1926: 3rd ed. in 5 v. **1930–1937. DWB**—This compilation contains extensive tables of frost data for the 106 sections of the United States. *Subject Headings:* **1. Frost frequencies 2. Climatic data 3. United States.**

1938

4C–209 551.524.37

Aseĭkin, R. N., **O fizicheskoĭ prirode radiatsionnogo zamorozka.** [Physical nature of radiation frost.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr, i Geofiz.*, 2(2–3):115–128, **1938.** 2 figs., 10 refs., 11 eqs. English summary p. 127–128. **DLC**—Theoretical study of the mechanism of radiation frost. The role of different factors in the intensity of frost (cloudiness, wind, humidity, and temperature of air, etc.) and some effects of frost on vegetation are discussed. *Subject Headings:* **1. Radiation frost 2. Frost intensity 3. Frost effects on plants.**

4C–210 551.524.37(479:57)

*Butskiĭ, P. A., **Kompleksnaia kharakteristika morozov subtropicheskoĭ zony SSSR.** [Complex characteristics of frosts of the subtropical zone of the USSR.] *Leningrad. Agrogidrometeorologicheskiĭ Institut, Materialy po Agroklimaticheskomu Raĭonirovaniiu Subtropikov SSSR*, No. 2:180–189, **1938.** 7 tables, 6 refs. **DLC**—Climatic conditions of Crimea, Caucasus and Middle Asia in winter are described and a classification of frost occurrence, according to accompanying cloudiness, wind velocity and relative humidity is given. Frequency of winter frosts in the Black Sea region is as high as 6 in 10 years (1 for Batum and 6 for Sochi). In Middle Asia frosts usually occur 2–3 times per winter. *Subject Headings:* **1. Local frost conditions 2. Frost frequencies 3. Black Sea Region, U.S.S.R.**

4C–211 551.524.37:525.555.4

Cornford, C. E., **Katabatic winds and the prevention of frost damage.** *Royal Meteorological Society, Quarterly Journal*, 64(277):553–587, Oct. **1938.** 21 figs., 20 refs. **DLC**—Description of a new instrument for recording surface air movements and of a special anti-radiation screen for grass minimum thermometers. These instruments were used for experimental investigations of variations in meteorological elements during katabatic winds. The purpose of this study was the development of methods for frost damage prevention. This problem is discussed on p. 585–587. *Subject Headings:* **1. Frost instruments 2. Frost prevention 3. Wind effects on frost.**

4C–212 551.524.37

Dobson, G. M. B., **Frost hollows and fruit trees.** *Royal Meteorological Society, Quarterly Journal*, 64(277):588–591, Oct. **1938.** 5 figs. **DLC**—A report on an experimental study on distribution of minimum temperatures near the ground under various weather conditions. *Subject Headings:* **1. Vertical temperature gradient 2. Frost pockets 3. Frost damage to orchards.**

4C–213 551.509.532 551.524.37(493)

Dufour, Louis, **Notes sur le problème de la gelée nocturne.** [Notes on the problem of night frost.] *Ciel et Terre*, 54(2):33–56, Feb. **1938.** 6 figs., 3 tables, 15 refs., 10 eqs. **DLC**—After a systematic review of the theory of nocturnal radiation and its role in determining night minima, a statistical and synoptic study of the minimum temperatures at Uccle, Belgium, during the winter of 1936–37 is presented, with 5 examples of situations which produced frost cited, and calculations made from air and soil temperature, humidity and cloud data discussed from the point of view of their prognostic value. Useful tables are presented for introducing the above parameters into the forecasting equations. *Subject Headings:* **1. Frost forecasting 2. Radiation frosts 3. Uccle, Belgium.**—*M.R.*

4C–214 551.582(564,569.4,62)

*†Egypt. Physical Dept., **Climatological normals for Egypt and the Sudan, Cyprus and Palestine.** Cairo, **1938.** 148 p. 8 figs., 2 maps, extensive tables, refs. **DLC**—A complete consolidation of mean data derived from long period observations of nearly 100 meteorological stations. The presented values show that frosts in this region are occasional phenomena or have not been observed at all. *Subject Headings:* **1. Frost frequencies 2. Climatic data 3. Egypt 4. Sudan 5. Palestine 6. Cyprus.**

4C–215 551.582(495)

*Mariolopoulos, Elias G., **To klima tes Ellados.** [The climate of Greece.] Athens, **1938.** 370 p. charts, tables, refs. In Greek. **DWB**—Gives an analysis of frost conditions in Greece (p. 84–89) and map and table of frost frequency in various points of this country. (*Same item as* 3J–134, Oct. 1952, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Greece.**

4C–216 551.582(47)

*Orlova, V. V. (*ed.*), **Klimatologicheskiĭ spravochnik Moskovskoĭ Oblasti.** [Climatological handbook for the Moscow District.] Moscow, Gidromet. Izdat., **1938.** 99 p. map, 25 tables. **DLC**—On p. 11–12, 29, entitled "Pervyĭ i poslednii moroz i prodolzhitel'nost' bezmoroznogo perioda" [First and last frost and duration of the frost-free period], mean and extreme data derived from series of observations (10 years to 54 years) for numerous stations of the Moscow District are given. *Subject Headings:* **1. Frost frequencies 2. Frost free period 3. Moscow Region, U.S.S.R.**

4C–217 551.524.37(474)

§*†Temnikova, Nataliia S., **Tipizatsiia zamorozkov Evropeĭskoĭ territorii Soiuza, ikh dlitel'nost' i povtoriaemost'.** [Classification of frosts in European U.S.S.R., their duration and frequency.] *Meteorologiia i Gidrologiia*, 4(6):26–44, June **1938.** 15 figs., 25 refs. **DLC**—On the basis of observations during 1891–1915, the author analyzes the conditions under which spring and autumn frosts form and establishes seven types of frost situations. The advection of cold (arctic or polar) air masses causes frosts. Their duration also depends on synoptic processes. Numerous charts illustrate synoptic situations, duration, frequency and distribution (seasonal and geographic) of frost. *Subject Headings:* **1. Frost distribution 2. Frost duration 3. Frost frequencies 4. Long period records 5. Synoptic conditions for frost 6. European U.S.S.R.**

4C–218 551.509.532

Uspenskiĭ, E., **O mestnom prognoze nochnykh zamorozkov.** [On local forecasting of night frosts.] *Meteorologiia i Gidrologiia*, 4(2):69–78, Feb. **1938.** 6 tables, 14 refs. **DLC**—A report on empirical investigations of methods used for frost forecasting. The author gives a brief description of the following methods: dry and wet bulb thermometers, dew-point, KAMMERMANN's, SMITH-DONNEL's, ÅNGSTROM's and MIKHALEVSKIĬ's, and established the correlation coefficients and the probable errors for every method and for various seasons. *Subject Headings:* **1. Frost forecasting 2. Forecast verification.**

4C–219 551.524.37(794)

Young, Floyd D., **The 1937 freeze in California.** *Monthly Weather Review*, 66(10):311–324, Oct. **1938.** 14 figs. **DLC**—A detailed description of frost conditions in California and of an unusual frequency of frost in 1937. Contrast between conditions around protected and unprotected mature citrus trees and the distribution of lowest temperatures are shown in numerous figures. The author also reviews damage caused by freezes. *Subject Headings:* **1. Freezes 2. Frost damage to citrus orchards 3. Frost protection 4. California.**

1939

4C–220 551.509.532(794)

Allen, Charles C., **Minimum temperature forecasting in the Central California citrus district.** *Monthly Weather Review*, 67(8):286–289, Aug. **1939.** 6 refs., 2 eqs. **DLC**—A description of geo-

graphical conditions of Central California and analysis of weather factors important in frost forecasting. The author presents two formulas adapted empirically to Central California. These formulas are: $T_m = D - \frac{D-28}{3} - \frac{H-30}{4}$ (when relative humidity is below 52%) and $T_m = D - \frac{D-28}{3} - \frac{H-30}{4} + \frac{H-52}{6}$ (when relative humidity is 52% or more). T_m—expected minimum, D—dew point and H—relative humidity at 5 p.m. (local time). *Subject Headings:* **1. Minimum temperature forecasting 2. Frost forecasting formulas 3. Central California.**

4C–221 551.509.62:634.8

Bender, Kurt, **Die Frühjahrsfröste an der Unterelbe und ihre Bekämpfung.** [Spring frosts on the lower Elbe and their prevention.] *Zeitschrift für angewandte Meteorologie*, 56(9):273–289, 1939. 9 figs., table, refs. **DWB**—The station network established on the lower Elbe and methods utilized to enable lay observers to read quickly and exactly the minimum and maximum thermometers are described. The effect of the environment upon the occurrence of frost in the vicinity of plants is considered with particular reference to wind direction and urban influences as illustrated by individual instances such as the late frost of 1938. The burning of solid naphthalene proved unsuccessful and instead artificial fog and brikett heating were used to reduce outgoing radiation and prevent frost occurrence in vineyards and orchards. *Subject Headings:* **1. Frost prevention 2. Spring frosts 3. Orchard heating 4. Vineyards 5. Lower Elbe Region, Germany.**—*I. L. D.*

4C–222 551.509.532(02)

Brunt, David, **Physical and dynamical meteorology.** 2nd ed. Cambridge, University Press, 1939. 428 p. figs., tables, refs. **DLC**—Analysis of conditions during night cooling processes is given on p. 122–132. The amount of outgoing radiation depends upon the rate at which the heat is conducted to the soil surface from below. This rate depends from three variables: the density (n_1), specific heat (C_1) and the specific conductivity of heat (K_1) of the soil surface. (For 1st ed. *see item* 2D–14, April 1951, *MAB.*) *Subject Headings:* **1. Frost forecasting 2. Nocturnal cooling 3. Brunt's formula 4. Textbooks.**

4C–223 551.509.532

Butskiĭ, P. A., **O tochnosti predskazaniia zamorozkov po skheme P. V. Siniavskogo.** [The accuracy of frost forecasting by P. V. Siniavskiĭ's method.] *Meteorologiia i Gidrologiia*, No. 1:47–50, Jan. 1939. table, refs. **DLC**—A criticism of Siniavskiĭ's method based on observational data of meteorological stations in Syktyvkar (near Ust'-Sysol'sk), Rostov-on-Don and Voronezh, showed that this method is not sufficiently accurate and consequently cannot be used for frost forecasting. *Subject Headings:* **1. Frost forecasting 2. Forecast verification.**

4C–224 551.524.37(42)

Hawke, E. L., **A July frost in Herts.** *Meteorological Magazine*, London, 74(883):205–207, Aug. 1939. tables. **DLC**—Brief report of a July frost which occurred the first time since the establishment of the climatological station in 1929. Similar reports were presented by the author in *Meteorological Magazine* under the titles: "Midsummer frost" (v. 72:136, 1937) and "August frosts in southern England" (v. 73:275, 1938). *Subject Headings:* **1. Summer frosts 2. Herts, England.**

4C–225 551.524.37(782)

Hoy, Harry E., **Minimum temperatures during spring and autumn at Lincoln, North Platte, and Scottsbluff, Nebr.** *Monthly Weather Review*, 67(4):89–94, April 1939. 10 figs., 2 tables. **DLC**—These three stations are representative of the eastern, central and western parts of the state of Nebraska for the determination of minimum temperature during the transitional periods of spring and autumn. Spring and autumn minimum temperatures, the probability of a freezing temperature and a killing frost are analyzed. *Subject Headings:* **1. Frost forecasting 2. Nebraska.**

4C–226 551.524.37 551.582(567)

*Iraq. Meteorological Service, **Mean monthly temperatures and pressure of three selected hours, mean monthly maximum and minimum temperatures, absolute and minimum temperatures and mean monthly rainfall.** *Iraq. Meteorological Service, Occasional Publication*, No. 1, 1939. 8 p. 5 tables. In English and Arabic. **DWB**—Mean data are given for the period 1929–1938. The values of air temperature variation show that frosts have been usually recorded as a night phenomenon only and the mean daily temperature remains above the freezing point throughout the year. *Subject Headings:* **1. Frost frequencies 2. Climatic data 3. Iraq.**

4C–227 551.509.532

*Jacobs, Woodrow C., **Application of Brunt's radiation equation to minimum temperature forecasting.** *Monthly Weather Review*, 67(12):439–443, Dec. **1939.** fig., 12 tables, 11 refs., 14 eqs. **DLC**—Analysis of various factors near the ground which control the decrease of air temperature during the night. The author shows that BRUNT's method is more valuable in forecasting minimum temperatures than purely empirical formulas. *Subject Headings:* **1. Minimum temperature forecasting 2. Brunt's formula 3. Nocturnal cooling.**

4C–228 551.509.532

Kardakov, V., **Novyĭ metod predskazaniia zamorozkov.** [New method of frost forecasting.] *Meteorologiia i Gidrologiia*, 5(12):139–140, Dec. **1939.** Discussion by D. K. GODNEV p. 140. **DLC**—The author presents a new formula for frost forecasting. This formula contains the elements of humidity, cloudiness, wind direction and velocity, and the rate of air temperature decrease. GODNEV states that a positive factor in author's formula is the use of the elements of wind (velocity and direction), which permit advective processes to be taken into consideration. *Subject Headings:* **1. Frost forecasting 2. Wind effects on frost. I. Godnev, D. K.**

4C–229 551.556:63

Manig, Marianne, **Nachweis von Kaltluft durch erfrorene Dahlien.** [Frozen dahlias as indicators of cold air.] *Meteorologische Zeitschrift, Bioklimatische Beiblätter*, 6(1):22–23, **1939.** fig. **DWB**—Near Schreiberhau (Silesia) early frosts develop in the wake of outbreaks of polar maritime air which reduce the air temperature close to the freezing point. Eradiation [outgoing radiation] and gravity accumulation of the cold air kills the dahlias in well circumscribed topographic troughs, the boundary of which can be readily mapped by noting frozen and unharmed dahlias. Potatoes and ferns are similarly affected. *Subject Headings:* **1. Synoptic conditions for frost 2. Frost pockets 3. Frost damage to flowers 4. Schreiberhau, Silesia.**—*H. Landsberg.*

4C–230 551.524.37(47)

§Nezdiurova, T., **Sinopticheskie ulsoviia vesennikh zamorozkov na territorii Kalininskoĭ Oblasti.** [Synoptic conditions of spring frost in the Kalinin region.] *Meteorologiia i Gidrologiia*, 5(4):42–56, April **1939.** 14 maps, refs. **DLC**—The study is based on the analysis of synoptic materials of the period 1931–1937. Four types of spring frost are distinguished by the author: 1) frosts caused by maritime arctic air, 2) continental arctic air, 3) common influence of various air masses and 4) radiation spring frosts usually in continental polar air without advection. Summary of frequency of these types is given. *Subject Headings:* **1. Spring frosts 2. Synoptic conditions for frost 3. Kalinin Region, U.S.S.R.**

4C–231 551.524.37:635.9

Schmauss, A., **Gerichtete Frostschäden.** [Orientated frost damage.] *Meteorologische Zeitschrift, Bioklimatische Beiblätter*, 6(4):187, **1939.** ref. **DWB**—The "virtual sky temperature" as observed by Falckenberg indicates differences in radiation toward various portions of the sky. Observations of frost damage in dahlia beds showed that central portions, eradiating toward the lowest virtual temperatures, were more damaged than the fringes which eradiated toward a sky portion of less effective temperature. *Subject Headings:* **1. Sky radiation 2. Frost damage to flowers.**—*H. Landsberg.*

4C–232 551.524.37(49)

*Tikhomirov, Innokentiĭ K. and Riazantseva, Zinaida N., **Klimat Zavolzh'ia.** [Climate of the Transvolga region.] v. 9. Moscow, **1939.** 397 p. 15 maps, 13 figs., 57+11 tables, 47 refs. **DLC**—In Chap. 3 (p. 61–104), entitled "Termicheskiĭ rezhim" (Thermic regime), the annual variations of air temperature, duration of seasons, soil temperature and soil freezing data are given. The frequency of frosts, variations of frost free periods, extreme data of early autumn and late spring frost based on long period observations are presented and discussed. *Subject Headings:* **1. Frost frequencies 2. Long period records 3. Frost free period 4. Transvolga Region, U.S.S.R.**

4C–233 551.524.37:551.584

Uspenskiĭ, E. N., **Meteorologicheskiĭ rezhim prezemnogo sloia vozdukha nad pakhotoĭ.** [Meteorological regime of the air layer near the ground over cultivated soil.] *Meteorologiia i Gidrologiia*, 5(2):80–107, Feb. **1939.** 25 figs., tables, 26 refs., eqs. **DLC**—In this microclimatic study, the author discusses the problem of nocturnal radiation frost, studies conditions important for frost and gives an equation which can be used for frost forecasting. *Subject Headings:* **1. Radiation 2. Microclimatology.**

1940

4C–234 551.524.37:551.584.31

Byram, G. M., **Experiments with the "frost pocket."** *U. S. Forest Service, Forest Research Bimonthly Reports*, Oct. 1; and Dec. 1, **1940.** p. 22–23; p. 25–26. Also: *U. S. Forest Service. Appalachian Forest Experiment Station, Report*, **1940.**—Radiation experiments were performed in an open topped, copper lined, insulated box (deep freeze) to duplicate conditions in a frost pocket. Temperature was found to be 25° lower inside than outside the box, even at midday. Water froze on warm, sunny days when air temperature was 54°F and the relative humidity double that outside. Field checks were made to verify conclusions. *Subject Headings:* **1. Frost pockets 2. Forest microclimatology 3. Deep freeze experiments.**—*M.R.*

4C–235 551.521.2

Elsasser, Walter M., **Radiative cooling in the lower atmosphere.** *Monthly Weather Review*, 68(7):185–188, July **1940.** fig., 4 tables, 9 refs. **DWB** Shows how to apply the author's graphical method for the determination of radiative heat transfer in the atmosphere. The cooling rate of free air per day is: $\Delta T = 1 + 2 \log w$; ΔT in °C; w—specific humidity. The cooling of a cloud under average conditions is $\Delta T = \frac{1{,}000}{d}$; d—thickness of the cloud in mb. The radiation chart can be used also for the determination of the heat loss at the ground for a cloudless sky, assuming "that the ground itself has the same temperature as the air near the ground." The effect of a temperature difference for nocturnal ground inversion is calculated taking also CO_2 radiation near the ground in account, while the graphical method itself is based only on water vapor radiation. *Subject Headings:* **1. Radiational cooling 2. Infrared radiation.**—*A.A.*

4C–236 551.509.532:551.524.37

*†Kessler, Otto Wilhelm and Kaempfert, Wolfgang, **Die Frostschadenverhütung.** [Frost damage prevention.] *Germany. Reichsamt für Wetterdienst, Wissenschafliche Abhandlungen*, 6(2), **1940.** 243 p. 215 figs., 41 tables, 431 refs. **DLC**—A most comprehensive study on meteorological conditions associated with night frost formation. Special attention is paid to methods of night frost forecasting and frost damage prevention. The author gives an analysis of the reaction of various plant species to frost. Exhaustive review of the investigations of frost damage in North America, Austria, Germany and Netherlands is added, as well as a report on special observations made in Trier and in some other places of Germany. (*See also* No. 42–38, *American Meteorological Society, Bulletin*, Feb. 1948.) *Subject Headings:* **1. Frost forecasting 2. Radiation frost 3. Frost damage to plants 4. Frost prevention.**—*M.R.*

4C–237 551.524.36

McDonald, Willard F., **Night radiation and unusual minimum temperatures near New Orleans, La.** *Monthly Weather Review*, 68(7):181–185, July **1940.** 3 figs., 2 tables, 8 refs. **DWB**—The author reports a minimum temperature difference of 25° on Nov. 30, 1938 between New Orleans Weather Bureau and Belle Chasse Weather Station, only 5½ miles away. Data on earlier similar occurrences are presented. An unusual feature is the lack of air motion in such instances. The pressure pattern accompanying the phenomenon is analyzed. This difference in temperature, which also appears in the annual records of minimum temperature obtained at the two nearby places, is mainly attributed to the influence of vegetation. *Subject Headings:* **1. Nocturnal cooling 2. Minimum temperatures 3. Cover influences 4. New Orleans, La.**—*G.T.*

4C–238 551.524.37:551.555.8(65)

*Petitjean, Lucien; Grandjean, A. and Dunoyer, Mme. M., **Le sirocco et les gelées en Algérie 1938 et 1939.** [Sirocco and frosts in Algeria 1938 and 1939.] *Algiers. Université. Institut de Météorologie et de Physique du Globe, Annuaire, 1939, Algérie du Nord*, **1940.** p. B1–B10. 8 charts, 6 tables. **NNA**—Observations of sirocco, frosts, and temperature maxima and minima are discussed, tabulated and shown by isolines. (*Same item as* 3A–213, Jan. 1952, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Sirocco 3. Algeria.**—*H.P.K.*

4C–239 551.555.6

Schubert, J., **Kälterückfälle und Nachtfröste. Wind-, Wasserdampf- und Waldeinfluss.** [Cold waves and night frosts. Influence of wind, water vapor and forest.] *Meteorologische Zeitschrift*, 57:406–410, Nov. **1940.** tables, 11 refs., eqs. **DWB**—From 57 years of record at Eberswalde the singularity of cold waves is computed and the frequency of minimum temperatures in May and June, given. Influence of wind on minimum temperature is studied. Average May frost at a height of 0.1 m is: −2.4°C for calm weather, −0.5°C on windy nights, and at the height of the screen (2.2 m) −0.4 and 2.2°C respectively. Relation between dew point and frost shown. Fre-

uency of night frosts from May to Sept. was 8.6 days in open field, 5.0 in pine, 4.5 in fir, 4.2 in beech orests and only 1.7 days in the city. *Subject Headings:* **1. Cold waves 2. Frost frequencies 3. Wind ffects 4. Forest influences 5. Eberswalde, Germany.**—*A.A.*

4C–240 551.584:632.111

Ullrich, Herbert and Mäde, Alfred, **Studien über die Ursachen der Frostresistenz. I und II.** Study of the causes of frost resistance. I and II.] *Planta, Archiv für Wissenschaftliche Botanik,* 8(2):344–351, **1938;** 31(2):251–262, **1940.** 13 figs., 16 refs. **DLC**—Elaborate experiments made t the Müncheberg Agr. Met. Station in 1937–1939 are described, for determining the heat exchange etween a plant and its environment at temperatures near 0°C, and the temperature at which reezing or damage occurs. Delicate thermo-elements were used to measure the temperature on the unny and the shady side of the leaf at different times of the day and with different sizes of leaves. A cold air pool was found to form over the center of a leaf at sunset. Heat is released on freezing, which suddenly raises the temperature of the leaf surface to that of the air. Data obtained in the ield and laboratory are shown in tables and graphs. Conclusion is that only turgescent or withered eaves are capable of being supercooled. Other cellular effects are mentioned. *Subject Headings:* **. Leaf microclimate 2. Leaf temperatures 3. Freezing effects 4. Frost resistance of plants.**—*M.R.*

1941

4C–241 551.524.37(794)

Baughman, Fred A., **Methods of vegetable protection and growth stimulation in the Imperial Valley, California.** *American Meteorological Society, Bulletin,* 22(9):373–374, Nov. **1941.** fig. **DWB**—An abstract of a paper read by the author at the Miami Meeting in May 8, 1941. Gives a escription of frost protection methods and the unprecedented frost of January 22, 1937, when very ow temperatures were recorded in all sections of the valley. In one of the generally favorable areas he temperature fell to 20.4°F and had an unusually long duration. *Subject Headings:* **1. Frost rotection 2. Imperial Valley, Calif.**

4C–242 551.524.37(794) 551.584

*Jacobs, Woodrow C., **Frost survey of Imperial County, California by United States Department f Commerce, Weather Bureau, in cooperation with Imperial County Agricultural Department. [1941?]** 32 p. 16 figs., 9 tables. Mimeographed. **DWB**—A thorough and detailed microclimatic tudy, based on 8 years of record (1932–40) for 27 stations in the Imperial Valley of southeastern California. This area is peculiarly subject of radiation frosts (288 nights in 8 years) which are reatly influenced by drainage, winds, and other local factors, though changes are not abrupt. A ovel method of representing steepness of slope of valley floor for the various stations, employs rrows of varying length which give a qualitative estimate of the air flow in both direction and speed. The average, extreme and duration of low temperatures are shown on isothermal charts and in- ividual freezes are plotted to show variability from night to night. Summarized for each of the 10 ears, 1930–40 also. *Subject Headings:* **1. Frost frequencies 2. Microclimatic studies 3. Imperial Valley, California.**—*M.R.*

4C–243 551.509.53

Milligan, James W., **Mathematical analysis of the significant factors in the hygrometric fore- asting equation for Florida minimum temperatures.** *American Meteorological Society, Bulletin,* 2(10):385–389, Dec. **1941.** fig., tables. **DWB**—An investigation on the accuracy of methods resently used for frost forecasting in Florida. The author pays special attention to correlation of .30 p.m. dew point observations with the difference between 6 inches deep maximum soil temperature nd minimum air temperature at $1\frac{1}{2}$ foot height. By using the formula $Y=a+b(D)$ it was found hat the average error for determining the probable minimum for each morning would have been .4°. *Subject Headings:* **1. Minimum temperature forecasting 2. Florida.**

4C–244 551.524.37:551.586:635.6

Pardue, Leonard G., **Experimental data on the freezing of plants at the Lakeland Meteorological Laboratory.** *American Meteorological Society, Bulletin,* 22(10):383–385, Dec. **1941.** table, fig. **DLC**—Experimental study with thermometers elevated 2, 5, 14, 24, and 43 ft. above the ground and ther instruments. The critical temperature for pepper and tomato plants was established during 941. *Subject Headings:* **1. Vertical temperature gradient 2. Frost effects on plants 3. Lakeland, Fla.**

4C–245 551.524.37 551.509.532(82)

*Puig, Ignacio, **El problema de las heladas.** [The frost problem.] *San Miguel, Argentina. Observatorio, Biblioteca Científica,* No. 19, **1941.** 48 p. 17 figs., 24 refs. **DWB**—The author

describes weather and local conditions associated with frost formation, presents mean data of frost frequency in Argentina and discusses the applicability of methods of frost forecasting in the country (especially those suggested by ANGOT and KAMMERMANN). Frost protection methods developed in other countries are also considered. *Subject Headings:* **1. Frost frequencies 2. Frost forecasting 3. Argentina.**

4C–246 551.509.62

Schonnopp, Günther, **Die Beregnung als Mittel zur Frostschadenverhütung.** [Sprinkling as a means of frost damage prevention.] *Deutsche Landeskultur-Zeitung*, Berlin, 10:73–76, **1941.** refs. **DA**—A non-technical account of investigations conducted in Germany on the way in which sprinkling of plants such as tomatoes, etc. prevents frost injury and the conditions under which sprinkling is effective. Sprinkling exerts a protective action by reducing outgoing radiation, raising conductivity of the soil heating by the water used for sprinkling and above all by the release of latent heat by the freezing of water. Plants were protected successfully up to temperatures of −3°C. It was found that sprinkling must begin when the leaf temperature attains −1°C and should be continued for the duration of the frost temperatures. *Subject Headings:* **1. Frost prevention 2. Sprinkling 3. Germany.**—*I.L.D.*

4C–247 551.555.6

Serra, Adalberto B. and Ratisbonna, Leandro, **As ondas de frio da bacia amazonica.** [Cold waves in the basin of the Amazon.] Rio de Janeiro, Ministério da Agricultura, Serviço de Meteorologia, **1941.** 21+21 p. numerous maps and graphs in append. In Spanish and French. **DLC**—The sudden temperature drop occurring in the states of Mato Grosso and Amazonas in Brazil is known as "friagem," when the temperature falls below freezing. In explaining this phenomenon, the author describes the general and secondary circulation over the Southern Hemisphere giving a detailed account of the various trajectories of the polar front during each season and the circulation and atmospheric conditions associated with the appearance of "friagem." The monthly and annual frequencies of "friagem" are given and three types of "friagem" are described. The behavior of meteorological variables during "friagem" is illustrated by extensive graphical material. *Subject Headings:* **1. Cold waves 2. Synoptic conditions for frost 3. Brazil 4. Southern Hemisphere.**—*I.L.D.*

4C–248 551.555.6 551.524.37

Woelfle, Max, **Bekämpfung von Sturm-, Wind- und Spätfrostschäden.** [Prevention of storm, wind and late frost damage.] *Forstwissenschaftliches Centralblatt*, Berlin, 63:49–60, **1941.** **DLC**—The meteorological conditions associated with the appearance of late frost are: 1) large scale incursions of cold air whereby outward radiation plays no role and 2) the appearance of favorable weather for outward radiation after the incursion of a cold air mass. The latter type of late frost is influenced by microrelief and produces greater damage. Good preventive measures are not available for late frost resulting from cold air incursions but various means are available to minimize the damage of radiation frost. These measures include local experience, climatic forest characteristics, reducing amount and size of clearings and channeling of small cold air inbreaks. The role of the forest meteorologist in the protection of forests against damage by weather is discussed. *Subject Headings:* **1. Cold waves 2. Radiation frost 3. Frost prevention 4. Synoptic conditions for frost.**—*I.L.D.*

1943

4C–249 551.524.37:63

Deasy, George F., **A tentative growing-season map of Argentina.** *Journal of Geography*, Chicago, 42(6):225–229, Sept. **1943.** 2 figs., table. **DLC**—Method of constructing a map of the growing season in Argentina and an analysis of the map. Data published by the U. S. Weather Bureau were used to construct a table showing: 1) length of period of record, 2) mean number of days in each month with minimum temperature of 32°F or below and 3) approximate length of the frost free season, in months. Data for 26 stations in Argentina, 2 each in Chile and Paraguay and one in Uruguay are given. The frost free season in Argentina varies from 12 months in the extreme northeast to less than 1 month in the southern Andes. A little over half of the country has a seven months frost free period—all of Mesopotamia and Chaco and large sections of the Pampa and arid northwestern plains and mountains. The southern part of Argentina has a growing season of from four to seven months and most of the Andean Highlands has a growing season of less than four months. Three factors control the distribution of frost free period: latitude, altitude and proximity to the sea. This paper presents a provisional map showing distribution of frost free periods. Map is correct in broad outline; more complete and accurate data are needed. (*Same item as* 3C–157, March 1952, *MAB.*) *Subject Headings:* **1. Frost free period 2. Growing season 3. Agricultural meteorology 4. Argentina.**—*M.L.R.*

4C–250 551.524.37(42)(410)

*Lewis, Lillian F., **The seasonal distribution over the British Isles of the number of days with a screen minimum temperature of below 32°F.** *Royal Meteorological Society. Quarterly Journal.* 69:155–160. April 1943. DLC—Data of frost days for the period 1914–1940 indicate that frost days are more frequent during Dec.–Feb. In autumn the frost days are less frequent than in spring. High frequency was observed in South Uplands of Scotland and in other high areas, and low frequency at coastal stations. *Subject Headings:* 1. **Frost frequencies** 2. **Long period records** 3. **British Isles.**

4C–251 551.524.37(432)(437)

*Meissner, Otto, **Frost- und Eistage in Dresden und Prag 1881–1940.** [Frost and ice days in Dresden and Prague 1881–1940.] *Zeitscrift für angewandte Meteorologie.* 60:9:284–291. 1943. 4 tables. DWB—A statistical study on frequency and variations of frost, and number of days with light and severe frosts in Dresden and Prague. *Subject Headings:* 1. **Frost frequencies** 2. **Dresden, Germany** 3. **Prague, Czechoslovakia.**

4C–252 551.524.37

*Troll, Carl, **Die Frostwechselhäufigkeit in den Luft- und Bodenklimaten der Erde.** [Freezing and thawing frequency in atmospheric and soil climates.] *Meteorologische Zeitschrift.* 60:1:161–171. 1943. 4 figs., tables, refs. DLC—The author shows that in the tropics, where the intradiurnal temperature variation leads at high elevations (3000–6000 m above sea level) to a very high frequency of days with nocturnal frost, the number of days with freezing and thawing may be as high as 337 days per year and is considerably greater than in moderate and polar latitudes. In the tropics such phenomena as polygonal soils may be seen. Data on frost alternation days are given for Arequipa, Nevado de los Huescos, El Misti, Vincocaya and Cuzco. *Subject Headings:* 1. **Frost frequencies** 2. **Radiation frost** 3. **Peru.**—*I.L.D.*

4C–253 551.524.37:551.582.2(56,581)

*U. S. Weather Bureau. **Climatic data for selected stations in and near Afghanistan and Turkey.** *U. S. Air Weather Service. Report.* No. 371. 1943. 19 p. extensive tables. *U. S. Weather Bureau. Special Report.* No. 242. 1943. DWB—Values tabulated for numerous stations in region: temperatures, duration of frost, precipitation, rain and snow, cloud amount, wind direction, velocity, gales, fogs. Years of records vary from 1 to 38. *Same item as* 2E–172. May 1951. *MAB. Subject Headings:* 1. **Frost duration** 2. **Climatic data** 3. **Turkey** 4. **Afghanistan.** I. Frankel, M. H.—*I.P.K.*

1944

4C–254 551.509.62:633.61

*Collins, J. O. and Hulse, S. H., **Report on area protection from frost.** *Standard Oil Development Company. Esso Laboratories. Process Div., Report.* No. PD-5M-44. March 1, 1944. 14 p. 9 tables, 3 photos, fig. DWB—The efficiency of the "Esso" U. S. Army Generator, Smoke Mechanical M1 100 gallons" in providing frost protection by means of the generated oil fog, is investigated. The instrumentation and experimental procedure are described. Owing to a heavy rain which resulted in water lying on the troughs between the rows of cane up to a depth of one foot the effectiveness of the oil fog in preventing frost could not be determined. It is suggested that the use of several generators spaced at intervals on windward side of area to be protected instead of one larger unit provides greater coverage; that fog blanket be started sufficiently before atmospheric cooling and over a large area to prevent inflow of cold air beneath fog blanket; and studies be made to determine the value of the oil fog as a radiation blanket. *Subject Headings:* 1. **Frost protection** 2. **Sugarcane** 3. **Oil fog** 4. **Louisiana.**—*I.L.D.*

4C–255 551.524.37(52)

*Landsberg, Helmut, **A climatic study of cloudiness over Japan.** *Chicago. University. Dept. of Meteorology. Miscellaneous Reports.* No. 15. 1944. 84 p. 21 figs., tables, diagrs. DWB—Mean data of frost days (monthly and yearly) for 21 stations are given among other data in tables entitled "Climatic data for stations" (in appendix). *Subject Headings:* 1. **Frost frequencies** 2. **Japan.**

1945

4C–256 551.524.37(94) 551.509.532

*§†Foley, James C., **Frost in the Australian region.** *Australia. Meteorological Branch. Melbourne. Bulletin.* No. 32. 1945. 142 p. maps, figs., tables, 12 refs. DWB—A comprehensive study of frost and frost forecasting. The physical processes of frost formation, influence of topography and of general weather conditions conducive to frost are described and analyzed in the first part, where the problem of frost damage in gardens and plantations and its minimizing or prevention is discussed.

Data of frost, frost frequencies and distribution over the country are investigated in the second and third parts. Pt. 4 takes up methods of frost prediction and frost warning. Extreme and average dates of the first and last minimum temperatures of 36°F and 32°F are presented on the appended maps. *Subject Headings:* **1. Physics of frost 2. Frost data 3. Frost forecasting 4. Frost effects on plants 5. Australia.**

4C–257 551.524.37:551.584.31(748)

Hough, A. F., **Frost pocket and other microclimates in forests of the Northern Allegheny Plateau.** *Ecology*, N. Y., 26(3):235–250, July **1945.** 7 figs., 2 tables, 23 refs. **DLC**—A microclimatic study made from 1932–1939 at 4 places in a shallow open valley in the Kane Experimental Forest of western Pennsylvania, showed the severity of conditions in these clearings and the reason reforestation did not occur. Frost pockets are a result of heavy cuttings, forest fires, killing of seedlings by deer, rabbits or frost, etc. and persist for years. The comparative data are presented in tables, graphs, histograms and schematic diagrams (showing formation of cold pool during the night). Conclusion is that radiation is more important than drainage in producing the low night temperatures and inversions in these pockets. Diurnal temperature range is greater in summer than in winter. Growing season is shorter in the pockets than out. *Subject Headings:* **1. Frost pockets 2. Forest microclimatology 3. Elk County, Penna.**—*M.R.*

1946

4C–258 551.524.37:634

Bush, Raymond, **Frost and the fruit grower.** 2nd ed. London, Toronto, Melbourne and Sydney, **1946.** 119 p.+23 plates. Review by John Grainger in: *Nature*, London, 158(4003):78, July 20, **1946. DLC**—The fruit yield in England varies in average by nearly 300% against 30% in the United States, 37.5% in Canada, and 17% in Australia. The causes of these variations are not yet determined but frost damage is very considerable. The author studies meteorological conditions associated with frost formation (especially cold katabatic winds), methods of frost forecasting and prevention of damage to fruit trees. *Subject Headings:* **1. Wind effects on frost 2. Frost prevention 3. Frost forecasting 4. England. I. Grainger, John.**

4C–259 551.524.37:001:551.525.2

Champion, Donald L., **What is a ground frost?** *Weather*, 1(6):186–188, Oct. **1946.** table. **DLC**—Discussion on the use of the terms: ground frost, radiation frost, wind frost. The best method of summarizing grass minima, in author's opinion, would be to tabulate all minima below 32°F. *Subject Headings:* **1. Grass minimum temperatures 2. Frost terminology.**

4C–260 551.509.62

Collins, J. O., **Report on evaluation of artificial oil fog as a means of frost protection.** *Standard Oil Development Company. Esso Laboratories. Process Div., Report*, No. PD-22T-46, Oct. 28, **1946.** 47 p. 7 tables, 8 figs., eqs. **DWB**—The effectiveness of oil fog produced by generators operating on the principle of the U. S. Army Generator, Smoke Mechanical M1 is tested by field tests in which a special radiometer was used to determine the degree of impedence of radiant heat loss by oil fog. The construction of the radiometer, which is basically a Cenco Radiation Thermopile, and its method of operation and the experimental field test are described. It is shown that the oil fogs which are characterized by a particle size of 0.5–0.6μ diameter are substantially transparent to the passage of infrared radiation with an average length of 10μ, even with fog concentration of about 2000 gal/sq mi. Oil fog is valueless commercially as a means of frost protection. (For similar study *see* 4C–254 above.) *Subject Headings:* **1. Frost protection 2. Oil fog 3. Radiometers.**—*I.L.D.*

4C–261 551.524.37:551.588.2:551.521(479)(58)

*Gol'tsberg, Ida Arturovna, **Vliianie rel'efa na zamorozki.** [Influence of relief on frosts.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, Trudy Nauchno-issledovatel'skikh Uchrezhdeniĭ, Ser. 1, Meteorologiia*, No. 34, Fizika prizemnogo sloia atmosfery, **1946.** p. 58–69, fig., 6 tables, 9 refs. **DLC**—Investigation is based on microclimatological observations made in the subtropical zone of the U.S.S.R. during 1933–1936 under the supervision of PROF. SELIANINOV. Probability of frost for the regions with altitude up to 1000 m above sea level is the same as for the plains. The decrease of continentality on the slopes at altitudes of 1000–2000 m causes also a decrease of frost frequency. The increase of outgoing radiation and heat deficiency in the regions higher than 2000 m mean more frequent frosts. Summer frosts for every day are probable at altitudes from 2400–2500 m (northern Caucasus), 2600–2800 (minor Caucasus), and 3000–3200 m (Pamirs). The duration of the frost free period is 45–50 days shorter in a closed valley and 15–20 days shorter on plateaus. *Subject Headings:* **1. Frost frequencies 2. Frost free period 3. Orographic effects 4. Radiation balance 5. Caucasus, U.S.S.R. 6. Pamirs, U.S.S.R.**

4C–262 551.509.532:551.521.3

*Kaempfert, Wolfgang, **Taupunkt, Trübungsfaktor und Nachtfrost.** [Dew point, turbidity factor and night frost.] *Zeitschrift für Meteorologie*, 1(2/3):74–76, Nov./Dec. **1946.** fig., 3 tables, refs. **DWB**—Frost forecasting as now carried out can be considerably improved with the dew point method if the turbidity factor is computed on the basis of simple measurements of the intensity of solar radiation. The normal solar radiation can be taken from nomograms as illustrated. The proposed method gives an idea of the water vapor content in the whole atmosphere, while the dew point measurement characterizes only the lowest layer of the atmosphere. *Subject Headings:* **1. Frost forecasting 2. Turbidity factor.**—*A.A.*

4C–263 551.501.6:551.509.532

Lönnqvist, Olov, **A frost prediction diagram.** *Arkiv för Matematik, Astronomi och Fysik*, 32A(13), **1946.** 7 p. 6 figs., table. **MH-BH**—Gives diagrams for reading off expected drop in temperature during the night for various combinations of length of night, state of ground, temperature, vapor pressure, cloud heights, sky cover. (*Same item as* 2D–169, March 1951, *MAB.*) *Subject Heading:* **1. Frost forecasting.**—*C.E.P.B.*

4C–264 551.509.532

Liutershteĭn, I. G. and Chudnovskiĭ, A. F., **Formula dlia prognoza nochnogo khoda temperatury vozdukha i prognoza radiatsionnykh zamorozkov.** [Formula for the prediction of the course of air temperature at night and of radiation frosts.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. i Geofiz.*, 10(3):247–264, **1946.** 2 figs., 10 tables, 18 refs., 70 eqs. English summary p. 264. **DLC**—An analysis of processes which accompany radiational cooling of the air layers near the ground. The relation between principal factors which form these processes are expressed by many formulas. The formula for radiation frost forecasting, verified in Tashkent, Ashkhabad and Sverdlovsk, proved to be successful in 70–90% of all cases. *Subject Headings:* **1. Frost forecasting 2. Forecast verification.**

4C–265 551.524.37:632.1:016

†Ulan-Ude, U.S.S.R. Buriat-Mongol'skiĭ Gosudarstvenyĭ Nauchno-issledovatel'skiĭ Institut Kul'tury, **Bibliografiia Buriato-Mongolii za 1890–1936 gg. v. 1, Estestvoznanie.** [Bibliography of Buriato-Mongolia 1890–1936. v. 1, Natural sciences.] Moscow, Akademiia Nauk, **1939.** 625 p. **v. 3, Sel'skoe, pushno-zvernoe i rybnoe khoziaĭstvo.** [Agriculture, fur farming and fish industry.] **1946.** 534 p. **v. 4, Zdravookhranienie.** [Public health.] **1940.** 219 p. **DLC**—Contains many items on frost and frost influence on plants. *Subject Headings:* **1. Frost 2. Bibliographies 3. Mongolia.**

4C–266 551.524.37(47):551.509.532

Vitkevich, V. I., **Zamorozki i bor'ba s nimi.** [Frost and its prevention.] *Sovetskaia Agronomiia*, Moscow, 4(5/6):26–34, May/June **1946.** 5 figs., 2 tables. **DLC**—A brief review of radiative and advective frost phenomena. Some remarks on methods of frost forecasting by observations of air temperature, dew-point, cloudiness and winds, and a description of installations needed for these observations and for frost prevention. In the Moscow Region, late spring frost can be observed as late as the middle of June, and early autumn frosts recorded in the last days of August. *Subject Headings:* **1. Frost forecasting 2. Spring frosts 3. Autumn frosts 4. Moscow Region, U.S.S.R.**

1947

4C–267 551.524.37(410)

Drummond, A. J., **Meteorological errors which die hard.** *Weather*, 2(4):104, April **1947. DLC**—Some remarks on the extreme low air temperatures for the British Isles. The −23°F temperature reading at Blackaddera (Dec. 4, 1879) is not representative, because measurement conditions were not strictly comparable with Stevenson screens. The true lowest temperature of the air for Scotland must be −17°F recorded at Braemar on February 11, 1895. *Subject Headings:* **1. Temperature extremes 2. British Isles.**

4C–268 551.509.53

Groen, P., **On radiational cooling of the earth's surface during the night, especially with regard to the prediction of groundfrosts.** *Netherlands. (K.) Meteorologisch Instituut, Mededeelingen en Verhandelingen, Ser. B*, 1(9), **1947.** 35 p. 17 figs., refs., eqs. **DLC**—One of the most important attempts to solve the problem of predicting ground frost by means of physical reasoning. A critical review of previous theoretical and semiempirical investigations on the mechanism of cooling in relation to water vapor and cloudiness is given (BRUNT, ÅNGSTRÖM, PHILIPPS, etc.). The author

emphasizes the inconstancy of the effective radiation and derives the dimensionless expression:

$$\frac{T-T_1}{u_0}=e^{\frac{t}{t_1}}\left[1-\phi\sqrt{\frac{t}{t_1}}\right]$$

T—temperature; $T_0=T_0-u_0$; $u_0=R_0/f$ (a dimension of temperature); R—effective radiation; index $_0$—initial moment; $f=\frac{\partial R}{\partial T}$; t—time; $t_1=\lambda pc/f^2$ (a dimension of time); λ—heat conductivity of the soil; ρ—density of air; c—specific heat of the soil; ϕ—the Gauss probability integral. Author claims that his formula gives better results even for the extreme conditions of the polar night in comparison with BRUNT's formula, used by H. WECHSLER (1936). Furthermore, the theoretical evaluation of f is shown, as well as the consideration of non-isothermal temperature distribution in the ground, the turbulent conductivity of air, stratified soil and vegetation. In the practical part of the paper, a numerical example is discussed, the determination of constants referring to radiation, to air and soil is shown and the practical application of forecasts outlined. Only a general forecast can be given; the effect of local conditions must be strongly considered (cool air drainage, etc.). *Subject Headings:* **1. Nocturnal cooling 2. Soil freezing forecasting.**—*A.A.*

4C–269 551.509.62

Keil, Karl, **Frostbekämpfung im hohen Norden.** [Frost prevention in the far north.] *Meteorologische Rundschau*, 1(1/2):40–41, July/Aug. **1947.** **DWB**—Short note on successful Russian experiments to maintain agricultural activity and to build houses and roads on permafrost soil under extreme Arctic conditions in Siberia. The frozen soil must be melted, the moss layer removed and careful observations of the melted layer must be made in order to prevent underground ice explosions, which can completely destroy houses, roads and fields. *Subject Headings:* **1. Permafrost 2. Arctic agriculture 3. Ice explosions.**—*A.A.*

4C–270 551.521:551.524.37

Kou, S. L., **Effective nocturnal radiation and the variation of temperature near the ground surface.** *Meteorological Magazine*, Nanking, 19(1/4):14–19, Aug. **1947.** 12 figs. English summary p. 14. **MH-BH**—A study on nocturnal cooling processes on the physical basis of occurrence of night frosts near the ground. *Subject Headings:* **1. Nocturnal frosts 2. Nocturnal cooling 3. Temperature variations.**

4C–271 551.524.37:633.491

Ratera, Enrique L., **Resistencia a las heladas de algunos Solanum (Turberarium) Argentinos.** [Resistance to frost of some varieties of Solanum (Turberarium) Argentinos.] *Sociedad Científica Argentina, Anales*, 143(6):258–263, June **1947.** table, refs. **DLC**—Lists 19 species and varieties of potatoes which other investigators had found to have a high resistance to frost. To determine the resistance of nine Argentine species of wild potatoes which are cultivated in the open country, a study was conducted at an experimental station at Villa Ortuzar during 1941–1945. The coordinates, altitude and summary of climatic data are given for the station. A table lists the species and extent of damage for selected dates in June and July, 1945. Summarizes the extent of damage to buds, flowers, leaves, stems and the entire plant of the various species at specific temperatures. (*Same item as* 3C–215, March 1952, *MAB.*) *Subject Headings:* **1. Frost resistance of plant 2. Potatoes 3. Argentina.**—*M.L.R.*

4C–272 551.509.62:634

Sarle, Charles Faye (*Bur. Agri. Economics, U. S. Dept. of Agri.*), **Frost and the fruit grower.** 9 p. Mimeographed. Talk to apple growers at Berryville, Va., Aug. 30, **1947.** **DWB**—Practical problems as spraying, smoking and heating are discussed. The latter one is the most efficient, the first too dangerous, the second not efficient enough. A microclimatic survey is necessary for selecting the best orchard location, and a fruit-frost warning service for economical frost prevention. *Subject Headings:* **1. Frost protection 2. Orchard heating.**—*A.A.*

4C–273 551.509.62

Weger, Nikolaus, **Die Frostschadenverhütung in der Landwirtschaft.** [Frost damage prevention in agriculture.] *Meteorologische Rundschau*, 1(1/2):29–38, July/Aug. **1947.** 10 figs., table. **DWB**—A general survey from the practical point of view. The synoptic conditions which gave rise to a killing frost on May 10, 1927 are cited as an example of an 8°C cold wave in the Rhine region (Arctic air). Physical principles are outlined and the influence of local peculiarities shown (catchment area of the flow of cold air). Frost prevention includes covering, flooding, smudging, sprinkling, artificial turbulence, heating, soil care and the improvement of the local climate by shelter belts and ponds. *Subject Headings:* **1. Frost prevention 2. Killing frosts 3. Microclimate control 4. Rhine Region, Germany.**—*A.A.*

4C–274 551.524.37:634

Young, Floyd D., **Frost and the prevention of frost damage.** *U. S. Weather Bureau, W.B.*, No. 1484, **1947.** 65 p. 40 figs., 6 tables. Reprint of: *U. S. Dept. of Agriculture, Farmers' Bulletin*, No. 1588. rev. Dec. **1940. DLC**—A summation of the practical knowledge to date of the causes, occurrence, forecasting and prevention of frost in orchards, especially with reference to citrus orchards in California and deciduous fruit orchards in Oregon and Washington. The effect of radiation, conduction, air drainage, water vapor, etc. is evaluated. Frost danger seasons in the United States are shown on charts. Effect of vegetation, glass, cloth and lath screen, adding moisture, heat or stirring the air; use and effectiveness of heaters and smudging and cost of these methods occupies the major part of this basic work. The functioning of the fruit frost service, observational methods, etc. are also treated. The first ed. of this bulletin appeared as *Farmer's Bulletin*, No. 1096, April 1920. *Subject Headings:* **1. Frost 2. Orchard microclimatology 3. Fruit Frost Service 4. Frost prevention 5. Pacific Coast States.**—*M.R.*

1948

4C–275 551.524.37:551.509.532(471.1)

§Angervo, J. M., **Zur Frage der Einwirkung absteigender Luftbewegungen auf die Sommernachtröste.** [The influence of descending air currents on radiation frost in summer.] *Geophysica*, Helsinki, 3:114–122, **1948.** 6 figs., table, 2 refs. English summary p. 122. **DWB, MH-BH**—Aerological and synoptic data for three days on which heavy radiation frost occurred in southern Finland (May 3, 4 and 19, 1947) are analyzed and discussed from the point of view of the theory advanced by JOHANSSON in 1913. It was found that subsidence (upper inversions) was present in the arctic air over Scandinavia in every case, and the consequent low humidities (shown for soundings at Helsinki, Stockholm, Archangel, Riga, etc.) resulted in increased outgoing radiation and severe frost as seen from table of minimum temperatures at 12 stations. (*Same item as* 7–66, July 1950, *MAB.*) *Subject Headings:* **1. Radiation frosts 2. Synoptic conditions for frost 3. Frost forecasting 4. Finland.**—*M.R.*

4C–276 551.524.37:551.509.532

Chudnovskiĭ, A. F., **Sposob predvychisleniĭ radiatsionnogo zamorozka, osnovannyĭ na uchete teplovogo balansa pochvy.** [Method for radiation frost prediction based on the account of thermal balance of soil.] *Vsesoiuznaia Akademiia Sel'skokhoziaĭstwennykh Nauk im. V. I. Lenina, Doklady*, No. 8:35–41, Aug. **1948.** 3 tables, 12 refs. eqs. **DLC**—Physical analysis of nocturnal cooling processes. Description of the theoretical basis and practical application of a method for radiation frost forecasting. *Subject Headings:* **1. Radiation frosts 2. Frost forecasting.**

4C–277 551.524.37:551.509.532(64)

*Debrach, Jean, **La prévision des gelées au Maroc.** [Frost forecasting in Morocco.] *La Terre Marocaine*, Casablanca, 18:57–60, **1948.** 2 figs., table, 10 refs. **DA**—A description of temperature conditions during winter and some considerations about methods of frost forecasting. Frost frequency and minimum air temperature are given on diagrams for different points of the country. *Subject Headings:* **1. Frost forecasting 2. Frost frequencies 3. Morocco.**

4C–278 551.509.532:551.524.37

Franssila, Matti, **On the forecasting of frost with Ångström's formula.** *Geophysica*, Helsinki, 3:102–113, **1948.** fig., 3 tables, 3 refs., 6 eqs. **DWB, MH-BH**—Using surface observations from Malmi airport (on the north coast of the Gulf of Finland, 60°15′N) and aerological data from Ilmala, the author applies ÅNGSTRÖM's formula ($t_m = C_1 t_1 - C_0 t_0 - k$) and comes to the conclusion that: a) the use of aerological measurements does not appreciably improve the accuracy of frost forecasts, b) the minimum temperature is practically independent of temperature variations in the air mass, c) the value of k in the above formula depends mostly on cloudiness and wind speed and hence the problem is mainly to forecast those two elements for the next night and d) if the air mass does not change, the use of psychrometer readings taken at 0800, 1400, 1700 or 2000 leads to no significant differences in accuracy of forecast of minimum temperature for the following morning. (*See* paper by ANGERVO, *item* 4C–275 above, which seemingly contradicts the basic conclusions of this paper.) (*Same item as* 7–27, July 1950, *MAB.*) *Subject Headings:* **1. Frost forecasting 2. Minimum temperatures 3. Finland.**—*M.R.*

4C–279 551.524.37:63

IAroslavtsev, I. M., **Zamorozki.** [Frosts.] Leningrad, Gidromet. Izdat., **1948.** 26 p. 12 figs. **DLC**—A booklet for popular use explaining the physical causes of autumn and spring killing frost (long wave radiation of the earth and atmosphere, local peculiarities, frost pockets, etc.). A series of practical indications is given and maps of the average first and last killing frost in the

European part of the U.S.S.R. are presented. Damaging effects of killing frost on different kinds of crop discussed and methods of frost prevention briefly outlined. *Subject Headings:* **1. Killing frosts 2. Frost prevention 3. Frost effects on crops 4. Frost pockets 5. European U.S.S.R.**—*A.A.*

4C–280 551.524.37:551.509.532

Iowa. State College of Agriculture and Mechanic Arts, **Final report on the statistical analysis of freeze data.** Contract Cwb 6028, Final report on freeze and normal studies, June **1948.** 20 p. 5 figs., 7 tables, 9 refs. **Final report on a study of normals in climatology.** *Ibid.*, 14 figs., 23 eqs. Corton, Edward L., Jr., **The influence of location on the length of freeze-free season in Iowa.** *Ibid.*, Thesis (M.S.) 63 p. 20 figs., 6 tables, 31 refs. **DWB**—The relations between the distribution of freeze data and the annual occurrence of spring or fall freezes are investigated mathematically and formulas for computation of the probability of freeze hazard given. In the second work, E. L. Corton investigates the influence of latitude, longitude and altitude on duration of frost free period and composes a system of equations for prediction of mean date of first autumn or last spring frosts and duration of frost free period. *Subject Headings:* **1. Freezes 2. Frost free period 3. Frost forecasting 4. Iowa. I. Corton, Edward L., Jr.**

4C–281 551.524.37:632.11

Stepanov, V. N., **Kharakteristika sel'skokhoziaĭstvennykh kul'tur po ustoĭchivosti ikh k zamorozkam.** [Characteristics of crops with respect to their frost resistance.] *Sovetskaia Agronomiia*, 6(4):82–87, April, **1948.** table. Microfilm. **DLC**—Author investigates the problem of plant damage caused by frost and determines, for various types of crops, the critical temperatures at which their normal growing is impossible or the plants are killed. *Subject Headings:* **1. Frost resistance of plants 2. Frost damage to crops.**

1949

4C–282 551.524.37:551.582(711)

*Conner, A. J., **The frost-free season in British Columbia.** Toronto, Canada, Meteorological Div., **1949.** 20 p. chart, tables. **DWB**—Text comprises 15 pages of discussion on causes of frost, local radiation and air mass peculiarities, variations with latitude and altitude in length of period with frost. Tables give elevation, years of record, average earliest and latest date of last frost in spring and first in autumn, and average length of frost free period for 285 stations, all shown on fold-in map. (*Same abstract as* 1–79, Jan. 1950, *MAB.*) *Subject Headings:* **1. Frost free period 2. Climatology 3. British Columbia.**

4C–283 551.524.37

Dimitz, L., **Untersuchungen über die Frostdauer in 2 m. und 5 cm. über dem Erdboden.** [Investigations of frost duration 2 m and 5 cm above the ground.] *Wetter und Leben*, 2(3/4):58–61, July **1949.** 4 tables, 3 refs. **MH-BH**—In Austria the frost free period at 2 m (screen frost) averages 24 days longer than at 5 cm (ground frost). The figures are very variable from year to year (Vienna 6 to 85 days) and place to place (3 to 45 days) depending on the relative frequency of radiation and advection frosts. (*Same item as* 2–113, Feb. 1950, *MAB.*) *Subject Headings:* **1. Frost free period 2. Microclimatology 3. Austria.**

4C–284 551.509.532

Faust, Reinhard, **Ein Hilfsmittel zur Nachtfrostvorhersage.** [An aid to night frost forecasting.] *Annalen der Meteorologie*, 2(3/4):105–111, March/April **1949.** 4 figs., 3 tables, 4 refs., eqs. German and English summaries p. 105. **DWB**—Night frost is defined as grass minimum below 0°C. Using 14 h data at Iserlohn, frost occurred on clear, calm nights when frost index $F = T + e$ was below 20 (T, screen temperature in °C, e, vapor pressure in mm). At Münster $F = 21.5$. For screen frost F' is about 14. Other rules for forecasting frost are compared, especially use of dew point instead of vapor pressure. (*Same item as* 2–55, Feb. 1950, *MAB.*) *Subject Headings:* **1. Frost forecasting 2. Germany.**—*C.E.P.B.*

4C–285 551.509.532

Kenny, Howard S., **Frost and low temperatures in the Wisconsin cranberry bogs.** Chicago, Ill., U. S. Weather Bureau, Jan. **1949.** 29 p. 30 figs., table, 7 refs. Manuscript. **DWB**—The paper represents the culmination of three years of investigations carried on at Chicago Forecast Center. A forecast tool is constructed for the use of all local forecasters who must deal with the Wisconsin bog problem. Humidity data and local factors are evaluated empirically in an objective fashion to forecast the minimum temperature for a key station. Regression lines can then be established to provide estimates of corresponding temperatures at specific bogs. Results obtained from the forecast tool must be modified subjectively (*Same item as* 3E–138, May 1952, *MAB.*) *Subject Headings:* **1. Objective forecasting 2. Frost forecasting 3. Agricultural meteorology 4. Wisconsin. I. U. S. Weather Bureau.**—*M.P.K.*

4C–286 551.509.62:551.586:634.3(794)

*Legg, Edwin M., **Annual report of the Fruit Frost Service, Redlands-San Bernardino District, State of California, season 1947/1948.** [1949.] [n.p.] tables. **DWB**—Summarizes temperature, wind and orchard heating work during one of the most adverse seasons on record (heating was resorted to on 22 nights). Also twenty wind machines are in use in the region, and it is agreed that when used in conjunction with heaters, they are very effective in reducing number of heaters required. Damage cited in detail. *Subject Headings:* **1. Frost frequencies 2. Frost protection 3. Fruit Frost Service 4. Wind machines 5. California. I. U. S. Weather Bureau.**—*M.R.*

4C–287 551.524.37(75)

*U. S. Weather Bureau, **The climatic handbook for Washington, D. C.** *U. S. Weather Bureau, Technical Paper*, No. 8; *W.B.*, No. 1516, **1949.** 231 p. 35 figs., numerous maps, diagrams and tables. **DWB**—On p. 9, 101–102, a record of frost for Washington, D. C. is given and a similar record for nearby stations in Virginia and Maryland. The dates of killing frosts and frost free periods are presented for Washington, D. C. (1872–1945) and for counties of Maryland and Virginia (1899–1945) for each year. (*Same item as* 2–159, Feb. 1950 and 3G–223, July 1952, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Washington, D. C. 3. Virginia 4. Maryland. I. Zoch, Richmond.**

1950

4C–288 551.509.62

Berliand, M. E. and Krasikov, P. N., **Issledovanie effektivnosti osnovnykh metodov bor'by s zamorozkami.** [Investigation on the efficiency of the principal methods of frost damage prevention.] *Leningrad. Glavnaia-Geofizicheskaia Observatoriia, Trudy*, 19(81):5–13, **1950.** 10 refs., eqs. **DLC**—A report on experimental investigations carried out by the Central Geophysical Observatory in 1946. During 1946–1949 various methods of damage prevention were tried and the effectiveness of white and black smoke for this purpose was established. Theoretical and experimental work for the determination of the fuel quota were carried out. *Subject Heading:* **1. Frost prevention.**

4C–289 551.509.532:551.524.37

Brablec, Josef, **Předpověď nočních mrazů podle Sinjavského.** [Forecasts of nocturnal frosts according to Siniavskiĭ.] *Meteorologické Zprávy*, 4(1/2):35–36, **1950.** table. **MH-BH**—In Czechoslovakia, forecasts of nocturnal frosts were hitherto based on the dew point. This method, however, can be applied with success under stable conditions only. SINIAVSKIĬ worked out a method based on temperature at 9 p.m. and its tendency between 2 and 9 p.m., on the wind during the same period and cloudiness at night. Independently from these values a forecast based on relative humidity is added. The table also provides for corrections on account of precipitation or thunderstorms. Although this method has been worked out for the station at Syktyvkar it can be applied to other places with some corrections based on elements of their microclimate. (*Same item as* 3E–157, May 1952, *MAB.*) *Subject Headings:* **1. Objective forecasting 2. Frost forecasting 3. Nocturnal cooling 4. Czechoslovakia.**—*G.T.*

4C–290 551.524.37

Courshee, R. J. and Hogg, W. H., **Frequency of wind and radiation frosts.** *Meteorological Magazine*, London, 79(938):235–236, Aug. **1950.** table. **MH-BH**—COURSHEE considers frequency of frost in England less than stated by W. H. HOGG (*see item* 4–80, April 1950, *MAB.*) Reply by HOGG. (*Same item as* 10–98, Oct. 1950, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Radiation frosts.**

4C–291 551.584(02) 551.524.37

Geiger, Rudolf, **Das Klima der bodennahen Luftschicht. Ein Lehrbuch der Mikroklimatologie.** [The climate near the ground. A textbook of microclimatology.] Brunswick, F. Vieweg, **1950.** 3rd ed. rev. and enl. 460 p. 195 figs., tables, bibliog. p. 408–446. English trans. of 2nd ed. by Milroy N. Stewart and others. Cambridge, Harvard Univ. Press, **1950. DWB**—Nearly every aspect of frost or minimum temperature microclimatology is considered in detail in this latest edition of GEIGER's classic text. Radiative factors, effect of dew point, wind, drainage, angle of exposure, height of neighboring trees or banks, effect of artificial covers, heating, smudging, wind machines, flooding, protective hedges, etc. in vineyards, orchards, crop storage areas, forest trees (seedlings) and ornamental trees are treated analytically with numerous tables, schematic diagrams, charts and references. The author and subject indexes are very useful, as the material on frost is scattered through every chapter. However, Chap. 41 on artificial frost protection reviews in great detail the recent literature on the subject and lists the methods of prevention which are in use in various countries, discusses frost pockets, effects on seedlings and tree growth; and gives quantitative data on vertical and horizontal temperature distribution without and with heating, etc. The bibli-

ography cites 24 references to literature which has appeared since KESSLER and KAEMPFERT (1939). (For abstract of English ed. *see* 2.1–158, Jan. 1951, *MAB.*) *Subject Headings:* **1. Microclimatology 2. Frost prevention 3. Horticulture 4. Textbooks.**—*M.R.*

4C–292 551.524.37:551.582(433)

*Hauer, H., **Klima und Wetter der Zugspitze; 50 Jahre meteorologische Beobachtungen des Observatoriums Zugspitze.** [Climate and weather at the Zugspitze Observatory.] *Germany. Deutscher Wetterdienst in der U. S.-Zone, Berichte*, No. 16, **1950.** 200 p. 67 figs., 16 photos, 165 tables, 128 refs. **MH-BH**—On page 63 in table No. 43 under title "Mittlere Zahl der Frosttage" (Mean number of frost days) and on p. 191 (table No. 156) "Zahl der Frosttage" (Number of frost days), the frost data for each month of the period 1900–1950 are given for the Zugspitze region. (*See also* 2.1-151, Jan. 1951, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Long period records 3. Zugspitze, Germany.**

4C–293 551.524.37(42)

Hogg, W. H., **Frequency of radiation and wind frosts during spring in Kent.** *Meteorological Magazine*, London, 79(932):42–49, Feb. **1950.** 6 photos, 6 tables, ref. **DWB, MH-BH**—Calculates mean frequencies of various intensities of radiation frost and wind frost in March, April and May at 15 stations, classified into hilltop, hillside, plain and coast, 1919–1948. (*Same item as* 4–80, April 1950, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Frost intensity 3. Spring frosts 4. Kent, England.**—*C.E.P.B.*

4C–294 551.509.34:551.524.37 551.501.6

Lessmann, H., **Ein Beitrag zum Problem der Vorhersage von Nachtfrösten und Strahungsnebeln.** [A contribution to the problem of forecasting night frosts and radiation fogs.] *Baden. Landeswetterdienst, Jahresbericht mit Abhandlungen*, **1950.** p. 46–52. 4 figs., 6 tables, 4 refs. **DWB**—The author discusses critically the use of tephigram by FAUST for predicting night frost and radiation fogs. The method is regarded as unreliable and cumbersome. The author then proposes a modification of the KAMMERMANN rule by taking into consideration the degree of continentality of the climate of a particular locality. (*Same item as* 2.9–44, Sept. 1951, *MAB.*) *Subject Headings:* **1. Frost forecasting 2. Radiation fog forecasting 3. Tephigrams.**—*I.L.D.*

4C–295 551.524.37:632

Palosuo, Erkki, **Hallaisuoskartan piirtämisestä.** [On the charting of frost incidence.] *Terra*, Helsinki, 62(1):28-35, **1950.** 3 figs., 11 refs. In Finnish, English summary p. 34–35. **DLC**—The author describes and presents examples of previous charts of frost incidence in Finland (JOHANSSON's based on 1892–94 data and BRANDER's (1923) chart of area where potatoes were raised in spite of severe summer frosts). He then shows how charts of frost incidence can be compiled from data on sensitivity of potatoes to frost. Three categories are plotted: those areas where freezing is generally expected, those where a crop is usually harvested and those where potatoes grow even during the worst summers with respect to frost. Marks of frost are very clearly indicated on potatoes. (*Same item as* 2.7-108, July 1951, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Frost resistance of plants 3. Finland.**

4C–296 551.524.37 551.509.62

Sapozhnikova, S. A., **Mikroklimat i mestnyĭ klimat.** [Microclimate and local climate.] Leningrad, Gidromet. Izdat., **1950.** 239 p. 89 figs., 123 tables. **DLC**—Chap. 18 (p. 171–174), "The battle against frosts" is concerned with the advent of frost either by advection or nocturnal radiation, measures of frost prevention such as heating the air by means of smoke and heating of the plants, and shielding of plants at night. BERLIAND's formula for calculating the reduction of effective radiation by smoke is given: $\Delta R = R\left(1-\varepsilon^{-\alpha\frac{p}{u}}\right)$, where R = effective radiation from 6 controlled points without smoke, p—expenditure of smoke producing substance, u—wind velocity, α—coefficient of extinction. The principles underlying heating by smoke production and instances of its effectiveness as well as that of heating the plants are discussed. (*Same item as* 3.7–10, July 1952, *MAB.*) *Subject Headings:* **1. Microclimatology 2. Frost prevention 3. Orchard heating 4. Smudging of orchards 5. Berliand's radiation formula.**—*I.L.D.*

4C–297 551.524.37:635

Schnelle, Fritz, **Kleinklimatische Geländeaufnahme am Beispiel der Frostschäden im Obstbau.** [Local climatic surveys according to frost damage to fruit culture.] *Germany. Deutscher Wetterdienst in der U. S. Zone, Berichte*, No. 12:99–104, **1950.** 5 figs., 3 refs. **MH-BH**—In a few valleys of the Odenwald the upper limits of the zone liable to frost were found by previous experience of

ruit growers, results of temperature measurements, observations of valley fog and topography. Between different sections of the valleys the cold air is blocked by narrowings or windings. In winding valleys, deflection of cold air stream causes differences between opposite sides. (*Same item as* 9–86, Sept. 1950, *MAB.*) *Subject Headings:* **1. Frost pockets 2. Frost damage to fruit . Odenwald, Germany.**—*C.E.P.B.*

4C–298 551.584.31:63(768)

Shanks, Royal E. and Norris, Fred H., **Microclimatic variation in a small valley in eastern Tennessee.** *Ecology*, 31(4):532–539, Oct. **1950.** 5 figs., 2 tables, 10 refs. **DLC**—The authors tudied the fall temperature pattern and trend, the frost pattern, and actual freezing damage to omato plants on the north and south facing slopes of a small east-west valley near Knoxville, Tennessee. The area was occupied by unpastured natural vegetation, with contrasting association egregates on the north and south slopes. Temperature was measured with maximum-minimum hermometers mounted one foot above the ground at 14 points in the valley. Stations on opposite lopes showed a mean temperature difference of 3°F, which was caused by differences in the maxima. The fall temperature trend showed increasingly lower maxima and minima, with south slope having he higher maxima, and the north slope the lower minima. Differences in minimum temperature n opposite slopes did not exceed 2°F and were usually 1°F; but they became critical during the reezing range. From an analysis of the frost pattern and freezing damage, it was concluded that he duration of freezing temperatures on a night of continuous record is a more reliable criterion of rost hazard than minimum temperature attained and that a 20 day difference in the length of the all portion of the growing season existed in a small topographic unit. (*Same item as* 2.5–182, May 951, *MAB.*) *Subject Headings:* **1. Microclimatology 2. Frost damage to tomatoes 3. Orographic ffects 4. Tennessee.**—*I.L.D.*

4C–299 551.524.37(479)

Skhiereli, V. S., **Kholodnye zimy 1948/1949 i 1949/1950 i povrezhdenie drevesnykh rastenii v Tbilisskom botanicheskom sadu.** [Cold winters of 1948/1949 and 1949/1950 and damage to trees n the Tiflis botanical garden.] *Akademiia Nauk SSSR. Gruzinskii Filial. Tbilisskii Botanicheskii Sad, Vestnik*, 59:63–96, **1950.** 4 tables, 6 refs. In Georgian, Russian summary p. 92–96. **DLC**—The usually mild weather regime during the winter seasons has changed in the two last winters, when minimum air temperatures reached −13° to −15°C. Severe frosts continued for a long time and caused great damage to subtropical plants. The author also gives a brief review of frost conditions in this region for a long period. *Subject Headings:* **1. Frost damage to trees 2. Tiflis Georgia, U.S.S.R.**

4C–300 551.524.37(439.1)

*Tónay, Frigyesné **Tavászi fagyok Magyarországon.** [Spring frosts in Hungary.] *Időjárás*, 4(3/4):66–73, March/April **1950.** fig., 8 tables. **MH-BH**—Tables are presented and discussed, showing frequency of minima and "radiation minima" of 0°, −1°, −2°, −3°, −4° and −5°, respectively, based on records for 13 stations (1930–1944) for the 3 decades of April and May. (*Same item as* 2.7–109, July 1951, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Frost intensity . Spring frosts 4. Hungary.**—*M.R.*

4C–301 551.509.532(52)

Ueki, H., **On the prediction of late frost.** *Journal of Meteorological Research*, Tokyo, 2(8):250–51, July **1950.** 4 figs., 2 tables, 4 eqs. In Japanese, English summary p. (6). **DWB**—Writing t_m = min. air temperature °C, t = temperature at 18 h, d dew point, v vapor pressure (mm at 18 h), uthor finds at Takada

$$t_m = 0.488t - 4.4$$

$$t_m - d = 1.88v - 8.52.$$

(*Same item as* 2.6–33, June 1951, *MAB.*) *Subject Headings:* **1. Frost forecasting 2. Forecast erification 3. Japan.**—*C.E.P.B.*

1951

4C–302 551.509.62:551.586:634.3

Angus, D. E., **Inclined axis frost fan trials in citrus orchards.** *Australia. Commonwealth Scientific and Industrial Research Organization, Section of Meteorological Physics, Sectional Report*, No. 1, Jan. **1951.** 24 p. tables, diagr., biblio. **DWB**—The author tested the hypothesis that the ange of the Australian type vertical axis fan which "sucks" down warm air can be increased by ilting the axis of the fan at a rather large angle to both the vertical and the horizontal. A description f the fan and of the experimental design and the temperature measurements obtained at various ngles of tilt are given. Both the area and the range of the 2°F temperature rise increased progres-

sively as the axis of the fan was tilted up to 60° from the vertical. (*Same item as* 3.9–78, Sept. 1952, *MAB.*) *Subject Headings:* **1. Frost protection 2. Orchard heating 3. Frost fans 4. Australia.**—*I.L.D.*

4C–303 551.524.37(410)

Belasco, J. E., **Freezing days in Great Britain.** *Meteorological Magazine*, London, 80(950):213–224, Aug. **1951.** 2 figs., 13 tables. **DWB**—A "freezing day" is one with 24 hour mean temperature below 32.5 or ½(max.+min.) below 32.6°F. Frequency tables and corresponding mean temperatures are given for various stations. Duration of spell (up to 34 days) at Kew, and spells below specified temperatures are tabulated. Relations to air mass are discussed and mean temperature in Siberian air (Dec. 20, 1938) and polar air (Dec. 15, 1950) illustrated. (*Same item as* 3.3–144, March 1952, *MAB.*) *Subject Headings:* **1. Temperature frequencies 2. Freezing temperature duration 3. Cold fronts 4. Air masses 5. Great Britain.**—*C.E.P.B.*

4C–304 551.509.62:551.524.4(94)

Frith, H. J., **Frost protection in orchards using air from the temperature inversion layer.** *Australian Journal of Agricultural Research*, 2(1):24–42, **1951.** photos, diagrs., graphs, biblio. Abstracted from reprint. **DLC**—The efficiency of the new 21 ft low speed vertical axis wind machine, described in this report, depends on the magnitude of the surface temperature inversion, the type of orchard and other factors. Graphs show typical inversions and variations thereof, including effects of orchards themselves on character of inversion, when compared with soundings over open ground. Horizontal extent of warming due to action of fan in citrus and almond groves is shown. Effect of time, of alternate operation of fan, etc. analyzed. Tests were made at Griffith, N. S. W. (*Same item as* 3.5–93, May 1952, *MAB.*) *Subject Headings:* **1. Frost protection 2. Frost fans 3. Wind machines 4. Temperature inversions 5. New South Wales. I. Australia. Commonwealth Scientific and Industrial Research Organization.**—*M.R.*

4C–305 551.509.62

Frost protection pointers. *California Citrograph*, 37(1):3, 24, Nov. **1951. DWB**—Practical suggestions for fruit growers regarding economical methods of orchard heating, weather observation, dew point measurement, wrapping material and the proper use of fruit thermometers, compiled from information supplied by the Agricultural Extension Service. A large number of small fires, in preference to a small number of large fires is indicated as serving the purpose of warming the atmosphere up to the ceiling-inversion layer or providing heat radiation in the case of a cold mass of air. *Subject Headings:* **1. Frost prevention 2. Orchard heating 3. Agricultural meteorology. I. U. S. Agricultural Extension Service.**—*G.T.*

4C–306 551.509.62:551.584

Daigo, Y. and Maruyama, E., **The micro-climatic observation on the method of protection of the tree trunk against cold.** *Journal of Agricultural Meteorology*, Tokyo, 7(1):7–8, Dec. **1951.** 2 figs., table. In Japanese, English summary, p. 8. **DWB**—Report on measurement of minimum temperature on the surface of uncovered trees and trees covered with a straw-matting. Daily results of the measurements for the period of one month are presented and equations developed for the correlation between temperature of covered trees and surface temperature of uncovered trees or free air temperature, respectively. *Subject Headings:* **1. Frost protection 2. Microclimate of forests.**—*G.T.*

4C–307 551.524.37(46)

*Due Rojo, Antonio and Gimeno Riutort, Antonio, **El regime de heladas en el Observatorio de Cartuja, Granada.** [Regime of frosts at the Cartuja Observatory at Granada.] *Revista Geofísica*, Madrid, 10(40):292–302, Oct.–Dec. **1951.** 47 tables. **DWB**—A comprehensive analysis based on long period observations (1902–1950). Duration of non-growing season is given graphically. Tables show large variations in the length of the non-growing season (from several days up to 147). CONRAD's methods were used for statistical analysis. (*Same item as* 4.3–151, March 1953, *MAB.*) *Subject Headings:* **1. Frost frequencies 2. Growing season 3. Cartuja Observatory, Granada, Spain.**

4C–308 551.509.62(774)

Hansen, C. M., **The helicopter rotor as a means of controlling frost damage in fruit orchards.** *Michigan Agricultural Experiment Station, Quarterly Bulletin*, 34(2):182–188, Nov. **1951.** 6 figs. Abstracted from reprint. **DWB**—A study was made of the area affected by helicopter rotation on a 20 ft tower during frosts in an orchard near Beulah, Mich., both with and without use of orchard heaters. Temperature of air at 300 ft above ground was determined by use of captive balloons. It was found that rotors bring warm air down and increase temperature thus preventing frost, if inversion conditions prevail. If not, heaters must be used. The rotor replaces about 200 heaters if

properly installed under suitable conditions. Most efficient operation was found when a combination of rotors and heaters was used. *Subject Headings:* **1. Frost fans 2. Frost prevention 3. Orchard heating 4. Wind machines 5. Beulah, Michigan.**—*M.R.*

4C–309 551.509.532:551.524.37:63

Jagsich, Juan, **La prevision de las heladas. Metodos sencillos y practicos, para uso de agricultores, vinateros, horticultores y floricultores.** [Frost forecasting. Simple methods and practices to be used by the farmer, vine grower, orchardist and florist.] *Revista Meteorologica*, Montevideo, 10(36–37):49–60, Jan.–April **1951.** 6 figs. **MH-BH**—Describes simple and practical methods to be used by persons engaged in various types of agriculture. Following a discussion of various factors that determine intensity of frost: temperature, wind, humidity, etc., the author outlines three methods for forecasting frost. Data for some of the graphs was obtained at Córdoba. (*Same item as* 3C–186, March 1952, *MAB.*) *Subject Headings:* **1. Frost forecasting 2. Agricultural meteorology 3. Argentina.**—*M.L.R.*

4C–310 551.509.532:635

Kenny, H. S., **Forecasting frost and low temperature for the cranberry bogs of Wisconsin.** *American Meteorological Society, Bulletin*, 32(7):273, Sept. **1951. MH-BH**—Abstract of paper presented at the 113th national meeting of the American Meteorological Society, Minneapolis, Oct. 9–11, 1951. The author gives an analysis of the problem of frost and low temperature forecasting and proposes a graphical method for forecasting, which can be applied by each Weather Bureau station. The regression equations were used for computations of local variations of air temperatures. *Subject Headings:* **1. Frost forecasting 2. Cranberry bogs 3. Objective forecasting 4. Wisconsin.**

4C–311 551.509.62

Rogers, W. S., **Protection from spring and autumn frosts by continuous water sprinkling.** *Commonwealth Bureau of Horticulture and Plantation Crops, East Malling, Annual Report*, 39:197–198, **1951.** 2 plates, 3 figs., 2 refs. **DWB**—Account of experiments on sprinkling plants with water which on freezing maintains plants at 32°F. Some plants though coated with ice suffered no damage. The method is commercially practicable within limits. *Subject Headings:* **1. Frost protection 2. Sprinkling.**—*C.E.P.B.*

4C–312 551.524.37:551.584.31

Rożański, Stanisław, **Kotliny chłodu.** [Frost pockets.] *Przegląd Meteorologiczny i Hydrologiczny*, v. 1950–1951:141–147, **1951.** fig., table. **DWB**—A hypothesis in which the author emphasizes the need of detailed studies and observations on this phenomenon for the benefit of agriculture, truck gardening, fruit growing and forestry, but mainly for the benefit of man and his settlements. His discussion is based on an article by J. Poholski (1948) and on 1950 data from P.I.H.M. stations located in southern Poland. *Subject Headings:* **1. Frost pockets 2. Agricultural meteorology 3. Poland.**—*W. Tomczykowski.*

4C–313 551.524.37:551.586:632

Sato, I. and Nishikawa, M., **The spring frost-damage on the flower and bud of the broad bean.** *Journal of Agricultural Meteorology*, Tokyo, 6(3/4):129–132, Aug. **1951.** 2 figs., 4 tables, 11 refs. In Japanese. **DWB**—*Subject Headings:* **1. Frost damage to plants 2. Agricultural meteorology 3. Beans.**

4C–314 551.524.37:551.586:631

Suzuki, S., Yoshida, Y. and Arai, T., **Does frost really bring injury to plants? (Preliminary Report).** *Journal of Agricultural Meteorology*, Tokyo, 7(1):17–18, Dec. **1951.** 3 figs., 4 refs. In English, Japanese summary p. 18. **DWB**—Experimental freezing of various plant leaves is discussed and claimed to prove that when the water on the surface or the sap inside the leaves freezes, the heat which is set free will protect the leaves against the effects of cold temperature. Curves showing the rise in plant temperature during the process of freezing are presented. *Subject Headings:* **1. Frost damage to plants 2. Plant freezing.**—*G.T.*

4C–315 551.509.33:551.509.532(52)

Takahashi, I., **Long-range forecast of frost damages.** *Journal of Meteorological Research*, Tokyo, 3(9):310–311, July **1951.** 2 figs., 2 tables. In Japanese. **DWB**—Table shows relation between sunspots and frost damage in Gumma Prefecture. Influence of April temperature and May precipitation on frost damage tabulated. Pressure deviations during many years (1885–1948) are also correlated with frost damage. *Subject Headings:* **1. Long range forecasting 2. Frost forecasting 3. Sunspot effects 4. Japan.**—*M.R.*

4C–316 551.524.37:581.036.5

Wie kommt es zum Frosttod der Pflanze? [What causes frost death of the plant?] *Umschau*, Frankfurt a.M., 51(24):759, Dec. **1951.** 3 refs. **DLC**—The material in this summary of an investigation on the effect of frost on plants is taken from "Cell physiological studies of frost resistance: a review" by G. W. Scarth, *New Phytologist*, 43:1, 1944. Harmful effects are caused by: a) freezing inside cells, b) freezing between the cells and c) effects of desiccation, respectively, in order of extent of damage. Thus, ice or desiccation, not low temperature itself, kills the plant. (*Same item as* 3.8–115, Aug. 1952, *MAB.*) *Subject Headings:* **1. Plant freezing 2. Frost damage to plants 3. Desiccation. I. Scarth, G. W.**—*G.T.*

4C–317 551.509.62

Wilcox, Richard, **Big Red, the frost killer.** *Steelways*, N. Y., No. 18:8–10, Sept. **1951.** photo, fig. **DWB**—Popular article on a frost dispelling device developed by Arthur W. Farrell and his collaborators at Michigan State College and manufactured by Evans Product Company, Plymouth, Mich. Stainless steel is heated by oil to a nonincandescent glow and gives out infrared rays which are claimed to be far more effective in warming plants than heat radiation. First models in 1951 were priced at $350 and consumed 10 gallons of oil an hour. Two pictures of the instrument in operation are presented. *Subject Headings:* **1. Frost prevention 2. Orchard heaters 3. Infrared radiation.**—*G.T.*

1952

4C–318 551.524.37:632.11

Aichele, H., **Untersuchungen über die Frostschutzwirkung eines Kalkanstrichs an Obstbäumen.** [Investigation on the frost protection effect of a lime tincture on fruit trees.] *Germany. Deutscher Wetterdienst in der U.S-Zone, Berichte*, No. 32:70–73, **1952.** 5 figs., 14 refs. **DWB**—The effect of lime tincture on tree temperature was investigated by serial cambium temperature measurements. It was found that painting with lime solution can be used as a preventive measure and it is enough to cover only the southern and western parts of the trees, because the large daily amplitudes of stem temperature which are the sources of the tree damages are diminished by that. *Subject Headings:* **1. Frost damage 2. Frost protection of orchards.**

4C–319 551.509.62:551.586:634.3

Angus, D. E., **Inclined axis frost fan trials in citrus orchards. Part 2.** *Australia Commonwealth Scientific and Industrial Research Organization, Section of Meteorological Physics, Sectional Report* No. 2, Feb. **1952.** 19 p. 10 figs., 2 plates, 7 refs. **DWB**—In continuation of the experiments described in Report No. 1 (*see* 4C–302 above) the distribution of temperature rise in an orchard due to the action of an inclined axis fan was investigated at different angles of tilt (up to 62° from horizontal), speeds of rotation and conditions of temperature inversion. After summing up results of the experiments, the author concludes that the fan investigated is more efficient than either American or earlier Australian types. Effectiveness and operation costs of fans are compared to those of burners. A diagram of the location of trees and equipment, a photograph of the experimental site and fan and curves of temperature distribution are presented. *Subject Headings:* **1. Frost prevention 2. Orchard heating 3. Frost fans 4. Wind machines 5. Australia.**—*G.T.*

4C–320 551.524.37:63

Antezana P., Octavio, **Las heladas y la agricultura.** [Frost and agriculture.] *Nimbus* 3(8/9):17–30, Jan./June **1952.** 3 figs., table, 6 refs. **MH-BH**—The influence upon plants of frost of various intensity, the different factors affecting frost intensity, and methods of frost prediction are discussed. A table of data on frost, obtained at 50 Bolivian stations, is presented for the period 1946–1950. *Subject Headings:* **1. Frost effects on plants 2. Frost forecasting 3. Frost frequencies 4. Bolivia.**—*G.T.*

4C–321 551.524.37:632.11

Bedrikovskaia, N. P., **Pitanie i morozoustoĭchivost' mandarinogo dereva.** [Nourishment and frost resistance of tangerine trees.] *Vsesoiuznaia Akademiia Sel'skokhoziaĭstvennykh Nauk im. V. I. Lenina, Doklady*, No. 4:30–34, **1952.** 4 tables, 4 refs. **DLC**—Report on investigations made by the Experimental Station of Subtropical Crops at Sochi during 1941–1949. Increase of mineral fertilization and enriching of soil by planting legume crops helped the tangerine trees to obtain a good resistance to frost, especially when the nitrous fertilizers were used in triple dose and the phosphorus in double dosage against the accepted standards. The tangerine trees which were given an increased amount of fertilizer brought heavy harvest after cold winters of 1947/1948 and 1948/1949. The best time for fertilizing the soil is in April and June. But the experiments have shown also that the phosphorus fertilizing of podzolic soil diminished the resistance of tangerine trees to frost. *Subject Headings:* **1. Frost prevention 2. Frost resistance of plants 3. Citrus orchards 4. Sochi, U.S.S.R.**

4C–322 551.524.37:635

Breuer, Wilhelm, **Frostschäden im Obstbau.** [Frost damage in horticulture.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 32:74–77, **1952.** 10 figs. **DWB**—A classification of frost damage in horticulture is given. Indirect damage is caused by solar radiation and moisture, direct damage by frost. Statistics of damage at different heights are given. Maximum damage occurs 40 and 50 cm above ground. *Subject Headings:* **1. Frost damage to orchards 2. Horticulture.**—*A.A.*

4C–323 551.509.62:635

Brooks, F. A., Rhoades, D. G. and Leonard, A. S. (*Calif. Univ., College of Agriculture, Davis*), **Frost protection tests with wind machines.** *California Citrograph,* Los Angeles, 38(1):4–5, 17, Nov. **1952.** diagrs. **DWB**—Report on frost protection tests conducted during 36 nights in the winter of 1951–52 at Riverside, using wind machines with different power and in different exposures with or without addition of fuel heaters. Temperature response under various conditions is discussed and graphically represented. The article is a reprint from *California Agriculture. Subject Headings:* **1. Frost protection 2. Wind machines 3. Frost fans 4. Horticulture 5. Riverside, Calif.**—*G.T.*

4C–324 551.509.62:634.3

Brooks, F. A., Kelly, C. F., Rhoades, D. G. and Schultz, H. B. (*Agricultural engineers, Univ. of Calif.*), **Heat transfers in citrus orchards using wind machines for frost protection.** *Agricultural Engineering,* St. Joseph, Mich., 33(23):74–78; 143–147, 154, Feb., March **1952.** 13 figs., table, refs., 8 eqs. **DLC**—Mathematical expressions for various modes of heat transfer during nocturnal radiation frosts, namely of radiation to the cold sky, of heat flow by convection from the free air, of heat released by trees and orchard air and of heat from condensation and freezing of moisture, are found and integrated. Experiments conducted at the Univ. of Calif. Citrus Experiment Station, Davis, using wind machines alone and combined with heaters are described and some of their results tabulated and presented in graphs and charts. Wind machines and measuring instruments are shown in photographs. *Subject Headings:* **1. Radiation frosts 2. Frost prevention 3. Radiation transfer 4. Wind machines 5. Davis, Calif.**—*G.T.*

4C–325 551.509.62:635

Frost protection pointers. *California Citrograph,* Los Angeles, 38(1):28–30, Nov. **1952. DWB**—In continuation of a series based on information from Agricultural Extension Service, practical suggestions are offered to heating apparatus operators in connection with optimum size and placement of heaters, weather factors frequently involving frost hazard, regulation of heaters, control of temperature and other details. (*See also* 4C–323 above.) *Subject Headings:* **1. Frost prevention 2. Orchard heaters.**—*G.T.*

4C–326 551.509.62:551.584

Carl, A., **Verbesserung des bodennahen Klimas und Frostschutz durch Beregnung.** [Improvement of the climate near the ground and frost protection by sprinkling.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 32:78–82, **1952. DWB**—The author assumes that extensive transpiration decreases the yield. He suggests reducing the time of transpiration but maintaining constant the total amount of water added by reducing the sprinkling rate to 2 mm/hr but increasing the sprinkling time. The usefulness of different types of equipment is discussed. The same equipment with a low sprinkling rate can be used also for frost protection. *Subject Headings:* **1. Agricultural meteorology 2. Artificial climates 3. Frost protection 4. Sprinkling.**—*A.A.*

4C–327 551.524.37:551.586:634.11(748)

Clarkes, William S., Jr. (*Penna. State College*), **The effect of low temperatures at similar dates in different years on the survival of apple bloom.** *American Meteorological Society, Bulletin,* 33(4):163–165, April **1952. MH-BH**—At State College, Pa., the average period of full bloom in apples is the second week in May, and frosts occur frequently at this time. The effect of frost upon apple blossoms varies with developmental state of blossoms, varieties of apples and with the parts of the blossoms. The effect is analyzed over a period of several years and damage is related to developmental state of bloom. *Subject Headings:* **1. May frosts 2. Frost damage to orchards 3. Apple orchards 4. Pennsylvania.**—*I.L.D.*

4C–328 551.524.37:632.11(47)

Genkel', P. A. and Margolin, K. P., **O fiziologicheskikh osobennostiakh, povyshaiushchikh ustoĭchvost' zernovykh kul'tur protiv zamorozkov.** [Physiological factors increasing frost resistance of crops.] *Akademiia Nauk, SSSR, Doklady,* 82(5):785–788, Feb. 11, **1952. DLC**—An incidence of frost in June 1950 in southern Russia is discussed. Frost damage to plants varied with topography;

at a distance of 20–50 m from forest belts less damage was observed. The frost resistance of different plants and at different developmental phases of the same plant depends on the viscosity of the protoplasm. High viscosity seems to be associated with good drought resistance and poor frost resistance. This circumstance may be important for the selective cultivation of plants in different climatic regions. *Subject Headings:* **1. Shelter belt effects 2. Frost resistance of plants 3. Drought resistance 4. U.S.S.R.**—*A.A.*

4C–329 **551.524.37:551.589.1**

Gutsche, Anneliese, **Über das Auftreten von Frösten bei verschiedenen Grosswetterlagen im Frühling und Herbst.** [Frost occurrences with different weather types in spring and autumn.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 42:288–293, 1952. 4 tables, 4 refs. **DWB**—Frost frequencies in April, May, Sept., Oct. at 5 German stations are tabulated by weather types (1881–1930) and regional differences discussed. *Subject Headings:* **1. Frost frequencies 2. Synoptic climatology 3. Germany.**—*C.E.P.B.*

4C–330 **551.509.33:551.509.532**

Hegyi, István, **Tél a tavaszban.** [Winter in spring.] *Időjárás*, 56(5/6):182–186, May/June 1952. **DWB**—The problem of long range forecasting of frost hazard in spring is presented in the form of an account of a meteorologist who, after having issued a correct short range forecast of frost hazard, speculates on possibilities of predicting such hazards one or two months ahead. He finds that the presence of warm air over the continent during late winter and early spring indicates high probability of subsequent frost in late spring. *Subject Headings:* **1. Frost forecasting 2. Long range forecasting 3. Hungary.**—*G.T.*

4C–331 **551.524.37:551.551.509.532(752/4)**

Johnson, Charles B., **Favorable spring frost conditions in the Middle Atlantic states.** *Weatherwise*, 5(2):38–40, April 1952. 3 figs., refs. **MH-BH**—A description of the general weather conditions associated with frost during spring in the fruit growing areas of Virginia, western Maryland and eastern West Virginia, and a tabulation of four years of data (1947–1950) "showing the frequency of frost mornings, the duration of frost periods, the wind speeds at sunrise and the temperatures on frost mornings." Criteria for predicting frost in the middle Atlantic states are derived; their validity was tested successfully in the spring of 1951. *Subject Headings:* **1. Frost frequencies 2. Frost forecasting 3. Middle Atlantic States.**—*I.L.D.*

4C–332 **551.524.37:551.584.31**

Kaps, E., **Die Frostgefährdung im Bendestorfer Tal.** [Frost hazard in Bendestorf valley.] *Germany. Deutscher Wetterdienst in the US-Zone, Berichte*, No. 42:258–263, 1952. fig., 5 tables, 6 refs. **DWB**—Author finds that a clear picture of the temperature conditions on a radiation night can be found with Assmann psychrometer, minimum thermometer and meteorograph. Errors of the last are discussed. A chart of the frost risk around Bendestorf shows that even in the small valleys of the N. German plain considerable temperature differences are to be expected. *Subject Headings:* **1. Radiation frosts 2. Microclimatology 3. Topographic effects 4. Germany.**—*C.E.P.B.*

4C–333 **551.509.62:634.3**

Kepner, Robert A. (*Calif. Agricult. Experiment Station, Davis*), **Effectiveness of heaters for frost protection in citrus orchards.** *Agricultural Engineering*, 33(2):79–84, Feb. 1952. 8 figs. **DLC**—Experiments conducted at California Citrus Experiment Station, Riverside, with 9 different kinds of heaters, are reported. Data on the effectiveness of various heaters under varying condition of radiation exchange, temperature inversion, cold air drift and heater placement are presented in tables and graphs and discussed. Heaters tested are shown in a photograph. *Subject Headings:* **1. Frost protection 2. Orchard heaters 3. Riverside, Calif.**—*G.T.*

4C–334 **551.588.2:551.584.31:551.524.37**

Knapp, G. and Knapp, R., **Beobachtungen über Mikroklima und Spätfrosterscheinungen im nordöstlichen Vogelsberg.** [Observations on microclimate and late frost incidence in the northeastern Vogelsberg.] *Wetter und Leben*, 4(3/4):49–51, April 1952. fig., 15 refs. **MH-BH**—A study of the influence of topography upon the formation of local cold air sinks using frost sensitivity of potatoes as an indicator. Severe frost damage was observed in bottom of valleys and light damage at foot of slopes. Land use is less important in influencing temperature minima than is topography. (*Same item as* 4.2–268, Feb. 1953, *MAB.*) *Subject Headings:* **1. Microclimatology 2. Topographic effects 3. Frost damage 4. Vogelsberg, Germany.**—*I.L.D.*

4C–335 551.509.62:581.1

Lehmann, Paul. **Eingriffe in den Wärmehaushalt oberirdischer Pflanzenorgane.** [Changing the heat economy of the plant organs above the soil.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* 32:67–70, **1952. DWB**—Different methods for frost protection of plants, i.e. heating, smoke production and sprinkling are discussed from the point of view of the heat economy of plants. One of the best methods is sprinkling. *Subject Headings:* **1. Frost prevention 2. Microclimatology 3. Sprinkling.**—*A.A.*

4C–336 551.509.532:551.509.62

Lessmann, H., **Frostwarnung und Frostschutz.** [Frost warning and frost protection.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 32:84, **1952. DWB**—A brief report on frost forecasting near the ground by means of a temperature-vapor pressure diagram and the Kammermann rule. A longer paper on this topic is published separately. (*See item* 2.9–44, Sept. 1951, *MAB.*) *Subject Headings:* **1. Frost forecasting 2. Frost protection 3. Kammermann's formula.**—*A.A.*

4C–337 551.524.37

Okanoue, M. and Usami, T., **On the late frost at Kumagaya.** *Journal of Agricultural Meteorology,* Tokyo, 7(2):58–61, June 1952. 2 figs., 2 tables. English summary p. 61. **MH-BH**—The date of occurrence of late frost at Kumagaya during the period 1912–1950 was investigated. Once in ten years it occurred on May 1; no frost occurred on April 5 and 6 during 24 years. The probability of occurrence of late frost was calculated as 0.0114, so that it may be considered as a singularity in seasonal change of temperature. Necessary conditions for occurrence of late frost are: 1) 0300 or 0600 o'clock temperature in Hokkaido, Sakhalin and the Maritime Provinces falls below 0°C and 2) the passage of a cyclone at long. 140 E across the Japan Sea or northeastward near the Kwanto District. *Subject Headings:* **1. May frosts 2. Synoptic conditions for frost 3. Kumagaya, Japan.**—*From authors' abstract.*

4C–338 551.524.37:634.95

Pravdin, L. F. and Filimonova, V. D., **Vliianie nizkikh temperatur na zhiznesposobnost' zhudeĭ.** [Influence of low temperatures on viability of acorns.] *Akademiia Nauk, SSSR, Doklady,* 85(4):921–924, Aug. 1, **1952.** 3 tables, 2 refs. **DLC**—The viability of acorns at low temperatures was investigated in the laboratory of a refrigeration industry where the acorns were placed into chambers with temperature from −20° to 5°C during 2–4 months. These experiments showed that the normal viability of acorns remains at temperatures not lower than −7°C. Drying of the acorns diminishes the germination (drying up to 47% lowered germination to 44%). The autumn sowing of acorns is possible in all regions where the winter soil temperatures at depth of 6–8 cm do not fall lower than −5°, −7°C. More intensive frosts can be endured for a short time only. *Subject Headings:* **1. Frost effects on plants 2. Acorn viability.**

4C–339 551.509.62:634

*Proverbio, Jose, **Dos ensayos de calentamiento del aire para evitar la accion de las bajas temperatures en frutales.** [Two devices for heating the air to prevent frost damage in orchards.] *Meteoros,* 2(1/2):117–129, Jan./June **1952.** 7 figs., 7 tables, 21 refs. English summary p. 117. **DWB**—Comparative data and graphs are presented for performance tests of two types of orchard heaters—one a "North American" type and the other a "modified North American" type emitting less smoke with a greatly enlarged chimney. The tests were made at the Cinco Saltos Experimental Station in a high valley (Rio Negro) on June 13 and 14 and during July and Aug. 1950 in an old orchard of Delicious, Rome Beauty and King David apples. Minimum thermometers were located up to 2 m height, and observations made every 30 min. Temperatures were raised 2.3°C on a night of strong radiation, and 1.3°C on a turbulent night with the N.A. model, and 2.7°C on the windy night with the "modified" type. Using 145 heaters per hectare, the temperature was kept above freezing when a temperature of −4.3°C occurred in the free air. *Subject Headings:* **1. Orchard heaters 2. Apple orchards 3. Frost prevention 4. Cinco Saltos, Experimental Station, Argentina.**—*M.R.*

4C–340 551.501.42:551.524.36:551.525.2

Rentschler, W. and Baier, W., **Anwendung der Regressionsrechnung auf mikrometeorologische Probleme.** [Application of the regression equation to micrometeorological problems.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. 42:384–389, **1952.** 6 figs., 6 tables. **DWB**—Regression equations and nomograms are developed for night minimum temperatures in a given exposure from minima in the screen and on bare soil. These give practical estimates of long period means and number of frost days to be expected. *Subject Headings:* **1. Minimum temperatures 2. Frost frequencies 3. Nomograms.**—*C.E.P.B.*

4C–341 551.509.62

Sch——, H., **Neue Methoden zur Verhütung von Nachtfrostschäden.** [New methods for avoiding night frost damage.] *Umschau*, Frankfurt a.M., 52(20):622–623, Oct. **1952.** 5 figs. **DLC**—On clear nights a strong inversion forms in lowest 30 m. Methods of destroying this cold layer by rotating propellers, and of maintaining temperature by watering, are summarized. *Subject Headings:* **1. Frost prevention 2. Sprinkling 3. Wind machines.**—*C.E.P.B.*

4C–342 551.524.37

Sigafoos, Robert S., **Frost action as a primary physical factor in tundra plant communities.** *Ecology*, 33(4):480–487, Oct. **1952.** 3 figs., refs. **DWB**—Influence of frost action on vegetation is not limited to permafrost areas, especially in tundra areas. Such action is evident as far south as 40° in North America. Intensity of frost action depends on interaction of all environmental elements (microrelief, microclimate, soil, glaciation, etc.). Microclimatic observations were made for 4 months (July–Nov. 1949) in low hills north of Nome, Alaska. Air and soil temperatures were read for 25 stations, recording thermographs used at 6 stations and recording soil thermographs (6″ depth) at 3 stations. *Subject Headings:* **1. Frost effects on plants 2. Micrometeorological observations 3. Nome Region, Alaska.**—*M.R.*

4C–343 551.509.62

Witte, Karl, **Untersuchungen zur Frage der Frostabwehr durch Beregnung.** [Investigations on the prevention of frost by sprinkling.] *Germany. Deutscher Wetterdienst in der US-Zone. Berichte*, No. 32:77–78, **1952. DWB**—A sprinkling rate of 1.5 mm/hr should suffice to prevent frost up to a temperature of −6° or −7°C. Various types of sprinkling equipment were tested. *Subject Headings:* **1. Frost prevention 2. Sprinkling equipment 3. Germany.**—*A.A.*

4C–344 551.524.36:581.1

Zakharov, M. I., **Rost rasteniĭ pri nizkikh temperaturakh.** [Growth of plants at low temperatures.] *Priroda*, Moscow, 41(1):118, Jan. **1952.** fig. **DLC**—According to the author the vital activity of plants is still maintained near 0°C. Observations on the growth of roots in frozen ground are described. *Subject Headings:* **1. Frost effects on plants 2. Plant growth at low temperatures 3. U.S.S.R.**—*A.A.*

4C–345 551.525

Zenker, H., **Über den Bodenfrost in Halle/Saale 1911 bis 1935.** [Soil frost in Halle/Saale 1911–1935.] *Angewandte Meteorologie*, 1(6):172–180, June **1952.** 5 figs., 2 tables, 15 refs. **MH-BH**—The daily measurements of soil temperature which were made at 0800 (Central European Time) at depths of 5, 10, 15, 25, 50, 75, 100 and 125 cm over the period 1911 to 1936 at Halle/Saale were analyzed with reference to the depth of penetration of frost in the soil, the number of days with soil frost (soil frost refers to frost in the soil in contrast to the frost on the soil as used in synoptic meteorology). The frost penetration during cold winters and the influence of cold temperature upon the soil at Halle/Saale is compared with that at Krüssau (1946–47) and Giessen (1939–40). The number of days with soil frost at a depth up $\leqslant 100$ cm is discussed and analysis of the frost frequency shows that the maximum is associated with anticyclonic and the minimum with cyclonic weather and that the New Year's thaw in Germany divides the winter season into two distinct periods: a relatively short pre-winter marked by frost temperatures at the 5 cm depth and midwinter where frost penetrates to a depth of 15 cm. The occurrence of frost periods in the soil of varying length is discussed. Tables and graphs contain data on frost penetration at Halle for every year of the period 1911–1936, mean numbers of days with temperatures below 0° and number of days with temperatures less than 0° at 5 cm, frequency of soil frost at depths of 5, 15 and 25 cm and begin of frost periods at specified depths. *Subject Headings:* **1. Soil temperatures 2. Frost penetration in soil 3. Halle, Germany.**—*I.L.D.*

1953

4C–346 551.5(02)

Sutton, Oliver Graham, **Micrometeorology: a study of physical processes in the lowest layers of the earth's atmosphere.** New York, McGraw-Hill, **1953.** 333 p. 35 figs., 30 tables, 232 refs., eqs.—Detailed information on radiation processes in the surface layer of the atmosphere is given on p. 158–189 (4 figs., 6 tables, 35 refs., 19 eqs.). After a short discussion on fundamental relations and short wave radiation, the author takes up long wave radiation and night minimum temperature forecasting. He discusses SIMPSON's treatment of long wave radiation and ELSASSER's radiation flux diagram, explains the use of the generalized absorption coefficient, shows the relation of nocturnal cooling to killing frost, takes up semi theoretical formulas (Ångström, Brunt, Groen) and gives a number of empirical formulas for ground and screen minimum temperature forecasting. (*Same item as* 4.2–15, Feb. 1953, *MAB.*) *Subject Headings:* **1. Radiation 2. Nocturnal cooling 3. Minimum temperature forecasting.**—*A.A.*

4C–347 551.5:06 551.509.532:63

U. S. Weather Bureau, **Weather and cranberries: an example of the role of weather maps and forecasts as an aid to agriculture.** Reverse side of: *U. S. Weather Bureau, Washington Daily Weather Map*, Nov. 13, **1946.** photos. Other pertinent titles in the same series: **Weather on Mount Washington.** Material submitted by Kenneth E. Gould. Feb. 3, **1947.** photos. **Weather and sugar beets.** Comp. by A. W. Cook. March 27, **1947.** photos. **The fruit-frost service.** Sept. 29, **1947.** photos, diagr. **Frost without freeze.** Comp. by J. K. McGuire. Oct. 28, **1949.** photos, diagr. **Weather and alfalfa seed.** Comp. by John W. Scotton. Feb. 10, **1950.** photos, diagr. **Freezing temperatures and the motorist.** Oct. 20, **1950. Weather in Death Valley.** Information supplied by Max K. Bankert. Jan. 31, **1952.** photos, table, diagr. **Spring weather and the home garden.** April 11, **1952.** table, diagrs. **Weather and livestock.** Material submitted by A. W. Cook. March 10, **1953.** illus., charts. **DWB**—A great deal of imagination and skill have gone into the preparation of these "map backs" describing and illustrating the services of the U. S. Weather Bureau in different parts of the country for various special interests. Colored pictures and charts show such activities as orchard heaters in operation, cattle being driven to lowlands upon the advent of the first severe weather of fall, the Mount Washington Observatory covered with ice, cranberry bogs flooded to prevent freezing, isopleths for the U.S.A. of date of last killing frost in spring and the first in autumn, the date on which the chance of frost falls to 10%, effect of altitude (inversions) on minimum temperature during frost, areas in the U.S.A. served by the fruit frost service, and synoptic series for an April cold wave and blizzard in the cattle region of the Northern Plains. Each one of these popular presentations is equivalent to a 4–6 page article in such journals as Weather or Weatherwise, but they are somewhat obscured by their being published in such a transient form. However, articles are often reprinted a year or so later, and available in quantity at a low cost for educational or display purposes. *Subject Headings:* **1. Synoptic conditions for frost 2. Frost prevention 3. Killing frosts. I. Gould, Kenneth E. II. Bankert, Max K. III. Cook, A. W. IV. McGuire, J. K.**—*M.R.*

SUPPLEMENTARY MATERIAL

4C–348 551.509.532

Spillman, W. J., Tolley, H. R. and Reed, W. G., **The average interval curve and its application to meteorological phenomena.** *Monthly Weather Review*, 44(9):197–200, **1916.** 2 figs., 4 tables, eqs. **DWB**—The average interval curve constructed by SPILLMAN under the assumption of a normal frequency curve has the equation $A = \left(\frac{1}{2} - \frac{1}{\sqrt{2\pi}} S\right)^{-1}$, where S is a series of $\frac{x}{D}$; x—deviation from mean; D—standard deviation. It gives the number of years in which $\left|\frac{x}{D}\right| \geq a$ can occur once (a—given number). The curve is an important aid for calculating agricultural weather risks. Samples show how to apply the method to killing frost data and for greenhouse planning. *Subject Heading:* **1. Frost forecasting formulas.**—*A.A.*

4C–349 551.574.42:016

†Maksimov, S., **Ukazatel' literatury po voprosu o zamorozkakh.** [Bibliography on killing frosts.] *Meteorologiia i Gidrologiia*, No. 4:129–136, April **1940.** 304 refs.—*Subject Heading:* **1. Killing frost bibliographies.**

4C–350 551.509.532

McCormick, D. G., **Frost forecasting for vegetable growers in the Hamilton area.** *Canada. Meteorological Div., CIR*-2021, TEC-100, **1951.** 5 p.—*Subject Headings:* **1. Frost forecasting 2. Hamilton, Ontario.**

4C–351 551.524.37:551.586.58

*Primault, B., **Les coiffes anti-gel et leurs répercussions sur le développement des ceps.** [Frost protection screens and their effect on the development of grape vines.] *Geofisica Pura e Applicata*, 20:186–196, July/Dec. **1951.** 10 figs., 2 tables, 2 refs. **MH-BH**—Microclimatic data obtained under straw and paper frost screens show that the straw is effective in reducing daytime temperature and keeping night temperatures above freezing, whereas paper covers increase the heat of mid-day and of frost at night. Under cloudy conditions, the effects are the same sign but of lesser intensity than during clear weather. Effects on vegetation are shown in photographs, and temperature effects are shown in tables and charts for instances in April and May 1951 at Swiss agrometeorological experiment station, Zurich. (*Same item as* 3.5–201, May 1952, *MAB.*) *Subject Headings:* **1. Frost protection 2. Agricultural meteorology 3. Viticulture 4. Zurich, Switzerland.**—*M.R.*

4C–352 551.509.62:634

Spurling, C. J., **Economy in orchard heating.** *Victoria, Australia. Dept. of Agriculture, Journal,* 49(12):584–586, 613, Dec. **1951.** photo. **DA**—Follows observations made by author on his property at Cobram, Eng. (photograph shown). Opens with a brief description of the theory of frost pocket formation. As a result of experiments, the author found it best to place heaters in strategic positions rather than distributing them evenly throughout the orchard. Also discusses the placing of thermometers and procedure to be followed in taking the readings. *Subject Headings:* **1. Orchard heating 2. Frost pockets.**—*M.L.R.*

4C–353 551.509.532:634

*Federal-State Frost Warning Service, Lakeland, Florida, **Report, 1943/44–1951/52.** 9 v. figs., maps, tables. **DWB**—"The Federal-State Frost Warning Service is operated jointly by the U. S. Weather Bureau and the Agricultural Experiment Stations of the University of Florida." Annual reports for Gainesville, Upper East Coast, Orlando, Brooksville, Ridge, Bartow, West Coast, Indian River, Everglades, and Lower East Coast districts include extensive minimum temperature data, descriptions of the various districts, forecast methods and verification, frost protection, and experimental work in progress. *Subject Headings:* **1. Agricultural meteorology 2. Frost forecasting 3. Frost warning services 4. Orchards 5. Florida.**—*M.P.K.*

4C–354 551.524.37

*Johnson, Warren O., **Winter minimum temperatures in Peninsular Florida. Summary of 15-year period 1937–1952.** Nov. 1, **1952.** 49 p. tables, maps, figs. Mimeographed. **DWB**—Data for monthly and annual normal precipitation, duration of low temperatures for each season, data of frost and last occurrence of 32 and 28°F. Maps show number of times and hours with temperatures below 32, 28 and 24°F. The text includes a description of Florida's frost warning service, discussion of each season and a short explanation of temperature inversions and causes of frost. *Subject Headings:* **1. Frost frequencies 2. Frost warning services 3. Florida. I. Federal-State Frost Warning Service, Lakeland, Fla. II. Moore, B. H. III. Smith, A. W. IV. Russell, Donald C.**—*A.A.*

4C–355 551.524.37

Thom, Herbert C. S., **The distributions of freeze-date and freeze-free period when a probability of no freeze exists.** *Cornell University. Biometric Unit, BU-30-M,* **1952.** 12 p. 5 tables, 4 figs., 6 refs., 12 eqs. Mimeographed. **DWB**—It has been shown that the freeze distribution is a mixture of the distributions of freeze-date and freeze-no freeze events. This has been applied both non-parametrically and assuming normal distribution of freeze date to three stations at three different thresholds to obtain the probabilities of freeze before or after any date. The distribution of the freeze-free period has been found and application made to one of the stations to obtain probabilities of the freeze-free period being less than a given length. The expression for the mean freeze-free period was also found and an estimate made of its value for the same station. Tables giving estimated probabilities of freeze for spring and fall at Anniston, Birmingham and Auburn (Alabama) are included. *Subject Headings:* **1. Frost frequencies 2. Frost distribution 3. Frost free period 4. Alabama.**—*Author's abstract.*

4C–356 551.509.532

James, W. E., **Forecasting ground frost.** *Meteorological Magazine,* London, 82(969):91–92, March **1953.** fig., 3 refs. **DWB**—The frost forecasting formula $T+D/2<79$ (*see item* 2–55, Feb. 1950, *MAB*) was tested for St. Athans, Glamorgan, with good results. *Subject Heading:* **1. Frost forecasting.**—*C.E.P.B.*

4C–357 551.509.532:634

*U. S. Weather Bureau, **Fruit Frost Annual Reports.** 1922–. tables, maps, charts, photos. **DWB**—Annual issuance at the various fruit frost district centers commenced as early as 1922 in Washington, but generally not till about 1931 in California, Idaho, Colorado, Texas and Alabama. Reports include descriptive summaries of temperature conditions during the season in question, tables showing minimum temperatures observed and forecast (verification computed), maps indicating station locations and local topographical features, tabulated data comparing effectiveness of various forecast methods, and occasional photos or descriptions of frost preventive measures and damage. Following available at Weather Bureau Library, Wash., D. C. (boldface indicates first published report for that particular station):

Central Calif. Citrus District 1930–1952
Chico, Calif., 1931–1952
Corona-Riverside, Calif., 1930–1952
Hamilton, Calif., 1930–1952
Kern County, Calif., 1926–1952
La Puente, Calif., 1925–1947 (last)
Napa County, Calif., 1936–1952
Paso Robles, Calif., 1936–1952
Pomona, Calif., 1930–1952
San Diego, Calif., 1939–1952
San Gabriel, Calif., 1930–1952
San Joaquin, Stanislaus, Calif., 1931–1952
San Jose, Calif., 1932–1952
Santa Paula, Calif., 1922–1952
Tulare County, Calif., 1938–1952
Whittier, Calif., 1922–1952
Medford, Ore., 1932–1952
El Paso, Texas, 1931–1932, 1940–1942
Rio Grande Valley, Texas, 1932, 1943, 1946–1952
Fruitland-Payette, Idaho, 1947–1952
Ellensburg, Wash., 1931–1934
Okanogan District, Wash., 1930–1952
Spokane, Wash., 1922–1926
Wenatchee, Wash., 1931–1952
Yakima and Benton Counties, Wash., 1923–1950 (none 1934–1944)
Grand Valley, Colo., 1931–1932
Gunnison, Colo., 1931–1932
Southern Alabama, 1932–1944

Subject Headings: **1. Agricultural meteorology 2. Fruit Frost Service 3. Frost forecasting 4. Orchards 5. Western United States.**—*M.P.K.*

4C–358 551.521.2 551.525:551.588

Fleagle, Robert G., **Radiation theory of local temperature differences.** *Journal of Meteorology*, 7(2):114–120, April **1950.** 7 figs., 15 refs., 27 eqs. **MH-BH**—The theories of radiational cooling advanced by BRUNT, WEXLER and GROEN are extended for the special case of obstructions (such as valley walls, trees, clouds [or buildings]) extending above the horizon, and for varying thickness of the ground surface layer. The rate of cooling and the minimum possible temperature in the absence of insolation are computed and curves shown for various types of surface and environment: ice covered river, light snow cover, compact snow cover, bare granite, obstructed horizon and clear horizon. Differences of 20°C between the extremes (ice-covered water and snow-covered terrain) are possible in a short distance. Obstructions reduce rate of cooling. (*Same item as* 8–55, Aug. 1950, *MAB.*) *Subject Headings:* **1. Radiational cooling 2. Topographic effects 3. Minimum temperature forecasting 4. Micrometeorology.**—*M.R.*

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodicals included in this section are for information only, and will not be listed in the monthly indexes until abstracted. When material is furnished in advance of date of publication, the pagination may be omitted.

American Meteorological Society, Bulletin, Volume 33, Number 10, December 1952.

Kraght, Peter E.: **Temperature and moisture gradients under low stratus clouds,** p. 403–408.

Radar weather conference at McGill University, September 1952, p. 408, 415, 419.

Rubin, Morton J.: **Southern Hemisphere synoptic analysis,** p. 409–415.

Randall, Dwight L.: **The helicopter as a meteorological tool,** p. 416–419.

Vonnegut, Bernard and Maynard, Kiah: **Spray-nozzle type silver-iodide smoke generator for airplane use,** p. 420–428.

Willett, H. C. and Bodurtha, Frank T., Jr.: **An abbreviated southern oscillation,** p. 429–430.

Birstein, S. J.: **The effect of relative humidity on the nucleating properties of photolyzed silver iodide,** p. 431–434.

Alpert, Leo: **Global synoptic maps,** p. 435–437.

Spar, Jerome: **Characteristics of the semi-diurnal pressure wave in the United States,** p. 438–441.

Beck, Niels C.: **Curriculum differences in meteorological education,** p. 442–443.

Reviews:

Brooks, Charles E. P.: **Proceedings of the First Pan-American Congress on Prehistory, 1947,** p. 428, 434.

Landsberg, H. E.: **Introduction to Physical Meteorology,** p. 434, 441.

Angewandte Meteorologie, Volume 1, Number 8, December 1952.

Schrödter, Harald: **Untersuchungen über die "Temperatursummenregel" an Hand der phänologischen Beobachtungen in Wernigerode 1854–1884 (unter besonderer Berücksichtigung einer Methode zur Bestimmung von Basistemperatur),** [Investigations into the "accumulated temperature rule" by means of phenological observations in Wernigerode 1854–1884 (with special reference to a method for determining the basic temperature)], p. 225–234.

Vilkner, Hans: **Wasseraufnahme und Verdunstungsschutzwirkung der Pflanzen. Untersucht mit der Differenzmethode bei der Bodenfeuchtigkeitsmessung,** [Water uptake and protective effect of plants against evaporation. Investigation by the difference method in measurement of soil moisture], p. 235–241.

Menges, Gustav: **Beginn und Ende des Winterschlafes unserer einheimischen Amphibien und Reptilien sowie die Zeiten der Lautäusserung unserer einheimischen Froschlurche in graphischen Darstellungen,** [Beginning and end of hibernation of our indigenous amphibia and reptiles and the times of croacking of our indigenous frogs shown graphically], p. 241–244.

Warmbt, W.: **Meteoropathologische Beobachtungen in Dresden bei Südsüdost-winden,** [Meteoropathological observations in Dresden during SSE winds], p. 244–255.

Annalen der Meteorologie, Volume 5, Number 3/5, 1952.

Professor Dr. Ernst Kleindschmidt . . . zu seinem 75 Geburtstage, [On his 75th birthday], **am 5.9.1952,** p. 65–66.

Huss, Eduard: **Die Fesselballonmethode mit Schiff als Hilfsmittel der aerologischen Grundlagenforschung,** [The captive balloon and ship as an aid to investigation of lower air layers], p. 67–71.

Grundmann, W.: **Der Keimgehalt der Luft und seine Messung,** [The germ content of the air and its measurement], p. 72–77.

Grunow, Johannes and Hommel, Karlheinz: **Temperatur- und Feuchtemessung in der Hütte mit dem doppelt aspirierten Psychrometer,** [Temperature and humidity measurements in the screen with a double aspirated psychrometer], p. 77–82.

Georgi, Johannes: **Solarkonstante und meteorologische Strahlungsmessung,** [Solar constant and meteorological radiation measurement], p. 83–96.

Albrecht, Fritz: **Einige neue Messgeräte für Ausstrahlung und Globalstrahlung,** [Some new instruments for outward and global radiation], p. 97–121.

Rodewald, Martin: **Das meteorologisch merkwürdige Jahr 1925,** [The meteorologically remarkable year 1925], p. 122–129.

Seilkopf, Heinrich: **Zur Entstehung tropischer Wirbelstürme,** [On the origin of tropical hurricanes], p. 130–140.

Sonntag, G.: **Die jahreszeitliche Abbängigkeit der Durchgangszeiten der Druckminima,** [The seasonal variation of the time of passage of pressure minima], p. 141–146.

Dinkelacker, Otto: **Die thermodynamische Begründung der Magnus-Formel,** [The thermodynamic basis of Magnus' formula], p. 147–148.

Annalen der Meteorologie, Volume 5, Number 6, 1952.

Müller-Annen, Hans: **Zur Prognose der Zugbahnen von Tiefdruckgebieten. Teil 2: Zugbahnen der Druckänderungsgebiete und synoptische Erklärungen,** [On forecasting tracks of depressions. Pt. 2, Isallobaric tracks and synoptic explanations], p. 161–168.

van Mieghem, Jacques: **Grossräumige Energieumsetzungen in der Atmosphäre,** [Large-scale energy transformations in the atmosphere], p. 168–174.

Herbst, Walter: **Radioaktive Isotope in der meteorologischen und angewandtmeteorologischen Forschung,** [Radioactive isotopes in meteorological and applied meteorological investigation], p. 175–184.

Krügler, Fritz: **Über extrem starke örtliche Schwankungen der Wasseroberflächentemperatur in Eisnähe am Rande des Ostgrönlandstroms. (Kurzbericht über maritim-meteorologische Beobachtungen in der Dänemarkstrasse),** [On extreme local variations of sea surface temperature near the ice on the edge of the East Greenland current. (Summary of maritime meteorological observations in Denmark Strait)], p. 185–188.

Kohlbach, Walter: **Ungewöhnlicher Schneefall im mittleren Niedersachsen am 3.3.1949,** [Unusual snowfall in central Lower Saxony], p. 189–190.

Schulz, Leo: **Über die Schneedecke im Oberharz,** [On the snow cover in upper Harz], p. 190–191.

Annales de Géophysique, Volume 8, Number 3, 1952.

Selzer, E.: **Manifestations semi-locales, instables, du magnétisme terrestre,** [Semi-local transitory effects of terrestrial magnetism], p. 275–285.

Dörmann, H.: **Das Magnetverfahren by Nahbebenregistrierungen,** [Magnetic device for registering earthquakes at a short distance], p. 286–293.

Mineur, Henri: **Recherche d'une influence possible de la lune sur les précipitations atmosphériques,** [Investigation of possible lunar effects on atmospheric precipitation], p. 294–308.

Lecolazet, R. and Hée, A.: **Sur la mesure de la radiactivité de l'air atmosphérique à l'aide du gammamètre,** [Measurement of the radioactivity of atmospheric air by means of a gammameter], p. 320–322.

Grenet, Gaston: **Les caractéristiques des séismographes électromagnétiques,** [Properties of electromagnetic seismographs], p. 328–332.

Knuckles, C. F. and Swensson, J. W.: **The spectrum of lightning in the region λ6 159–λ7 157,** p. 333–334.

Annales d'Astrophysique, Volume 15, Number 3, 1952.

Barbier, Daniel: **Solution approchée d'un problème de transfert et son application à la détermination des corrections de diffusion dans les mesures photométriques de la lumière du ciel nocturne,** [Approximating solution of a transfer problem and its application to photometric measurements of the night sky], p. 247–259.

Peyturaux, R.: **Contribution à l'étude du fond continu du spectre solaire dans le proche infrarouge,** [Contribution to the study of the continuous background of the solar spectrum in the near infrared], p. 302–351.

Dufay, J.: **Sur la recherche des raies interdites ^2D–^2P de l'atome neutre d'azote dans le spectre d'absorption de l'atmosphère solaire,** [Investigation of the forbidden bands ^2D–^2P of the nautral atom of nitrogen in the absorption spectrum of the solar atmosphere], p. 359–360.

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Bolle, A. and Dominici, P.: **Contributo al calcolo dell'assorbimento nella propagazione ionosferica delle onde corte,** [Contribution to the calculation of absorption in the ionospheric propagation of short wave], p. 377–396.

Cialdea, R.: **La spedizione dell'I.N.G. a Khartoum in occasione dell'eclisse totale di sole del 25/2/1952,** [Expedition of the I.N.G. to Khartoum at the time of the total eclipse of the sun on February 25, 1952], p. 409–416.

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Flohn, Hermann: **Hochgebirge und allgemeine Zirkulation. II. Die Gebirge als Wärmequellen,** [High mountains and general circulation. 2. The mountains as heat sources], p. 265–279.

Chiu, Wanpcheng: **On the oscillations of the atmosphere,** p. 280–303.

Hoinkes, Herfried: **Probleme der alpinen Synoptik,** [Problems of Alpine synoptics], p. 304–325.

Dufour, L.: **Sur les transformations adiabatiques réversibles d'une goutte de solution en suspension dans l'atmosphère,** [On the adiabatic transformations of a drop of solution suspended in the atmosphere], p. 346–349.

Schweitzer, H.: **Versuch einer Erklärung des Föhns als Luftströmung mit überkritischer Geschwindigkeit,** [Attempt to explain the föhn as an air flow with hypercritical velocity], p. 350–371.

Verzár, F.: **Kondensationskernzähler mit automatischer Registrierung,** [Condensation nuclei counter with automatic registration], p. 372–376.

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Sauberer, F.: **Der Strahlungshaushalt eines alpinen Sees,** [Radiation economy of an Alpine lake], p. 253–274.

Karapiperis, Ph. P.: **The structure of the weather at Blue Hill as indicated by the hours at which the diurnal extremes of temperature occur,** p. 275–280.

Hofstetter, G.: **Die interdiurne Veränderlichkeit von Seeoberflächen- und Seeabflusstemperaturen,** [The interdiurnal variability of lake surface and lake outlet temperatures], p. 281–293.

Aulitzky, H.: **Frostmeteorologische Untersuchungen an der Wald- und Baumgrenze in den Zentralalpen,** [Frost meteorological investigations of forest and timber lines in the Central Alps], p. 294–310.

Ekhart, E.: **Zur Anomalienmethode,** [Anomally method], p. 310–316.

Brunnhölzl, K., Schedel, F. and Ungeheuer, H.: **Schmerzempfindung und Wetter,** [Weather and sensitivity to pain], p. 317–326.

Reiter, R.: **Neuere Untersuchungen zum Problem der Wetterabhängigkeit des Menschen,** [New investigations of the problem of man's dependence on weather], p. 327–377.

Geofisica Pura e Applicata, Milan, Volume 23, 1952.

Weber, Max: **Über die Indikatorgleichung eines Seismometers,** [Indicator equation of a seismometer], p. 1–5.

Gaibar-Puertas, C.: **Increase of the earth's mean magnetization,** p. 6–20.

Sbrana, Francesco and Bossolasco, Mario: **Sul regime termico degli strati superiori della crosta terrestre,** [Thermal regime of the upper layer of the earth's crust], p. 21–26.

Castoldi, Luigi: **Sulla distribuzione della temperature negli strati superiori della crosta terrestre,** [On the distribution of temperature in the upper layer of the earth's crust], p. 27–35.

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Burkard, O., Mallinger, F. and Schwarz, F.: **Die F-Ionization in den Morgenstunden,** [The F-ionization in the morning], p. 43–59.

Ranzi, Ivo: **Sul carattere delle tempeste ionosferiche osservate a Buenos Aires,** [On the character of the ionospheric storm observed at Buenos Aires], p. 60–64.

Ranzi, Ivo: **Una notevole anomalia della regione F2 nell'Antartide,** [An unusual anomaly of the F2 region of the Antarctic], p. 65–68.

Bullrich, K., de Bary, E. and Möller, F.: **Die Farbe des Himmels,** [The color of the sky], p. 69–110.

James, R. W.: **A thermal cycle in the atmosphere,** p. 111–123.

Jaggi, Martin: **Farbphotographien eines Sonnenhalos in Cuba,** [Color photographs of a sun halo in Cuba], p. 124–129.

Krames, Karl: **Nordhemisphärische Niederschlags- und Temperaturschaukeln,** [Northern hemispheric precipitation- and temperature fluctuation], p. 130–136.

Vittozzi, Pio: **L'assorbimento della radiazione solare da parte di uno strato di polveri vulcaniche,** [Absorption of solar radiation by a layer of volcanic dust], p. 137–144.

Wegener, Kurt: **Über die Temperatur der Sonne nach dem Wien'schen Verschiebungsgesetz,** [The temperature of the sun according to Wien's displacement law], p. 145–146.

Schüepp, W. and Wegener, Kurt: **Zur Definition des Begriffes der Intensität der Sonnenstrahlung,** [The definition of the concept of solar intensity], p. 147–152.

Karapiperis, Leon N.: **On the surface temperature of Greek waters,** p. 153–161.
Dammann, W.: **Der Föhn als Randproblem der atmosphärischen Dynamik,** [Föhn as a marginal problem of atmospheric dynamics], p. 162–173.
Zanon, Francesco Saverio: **Singolarita fitofenologiche del 1951 nel bioclima di Venezia,** [Phytophenological singularities in the bioclimate of Venezia], p. 174–184.
Koch, H. G.: **Über den Seewind von Rom,** [The seawind of Rome], p. 185–211.
Pogade, G.: **Bericht über die Tagung der Meteorologischen Gesellschaft in Hamburg vom 24.-26. August 1952,** [Report on the Conference of the Meteorological Society in Hamburg, August 24–26, 1952], p. 212–316.
Berckheimer, H.: **Bericht über die Jahrestagung der Deutschen Geophysikalischen Gesellschaft in Hamburg vom 27. bis 30. August 1952,** [Report on the Annual Conference of the German Geophysical Society in Hamburg from Aug. 27 to Aug. 30, 1952], p. 217–222.
Zürich, E. Wanner: **Bericht über die erste Tagung der Europäischen Seismologischen Kommission, Stuttgart 22.–27. September 1952,** [Report on the first Conference of the European Seismological Commission, Stuttgart Sept. 22–27, 1952], p. 223–231.
Berg, Hellmut: **Compte-Rendu du 2.ème Congrès International de Météorologie Alpine tenu à Obergurgl (Oetztal, Autriche) du 19 au 22 Septembre 1952,** [Transactions of the 2nd International Meteorological Alpine Congress held at Obergurgl (Oetztal, Austria) September 19–22, 1952], p. 232–235.

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Pelleboer, J. H.: **Zandhoosejes,** [Dust devils], p. 214.

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Malrukar, S. L.: **A reply to "Some aspects of tropical meteorology with special reference to the Indian weather—An examination of Malurkar's concepts regarding them,"** p. 303-307.

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Lindquist, Rune: **An investigation of the ionizing effect in the E-layer near sunrise,** p. 439–458.
Whybrew, Waldo, E., Kinzer, Gilbert D. and Gunn, Ross: **Electrification of small air bubbles in water,** p. 459–471.
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Schmauss, August: **Die Entdeckung der Stratosphäre im Jahre 1902,** [The discovery of the stratosphere in 1902], p. 161–163.
Regula, Walter: **Untersuchungen über die Grundlagen einer Vorhersage-Topographie,** [Investigations into the bases of a prebaratic topographic forecasting map], p. 164–168.
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Schlegel, Max: **Alpin-meteorologische Tagung in Obergurgl (Ötztal, Tirol),** [Alpine meteorological meeting in Obergurgl (Ötztal, Tirol)], p. 184–185.
Heybrock, Werner: **Beobachtung von Perlschnurblitzen,** [Observation of bead lightning], p. 186.

Monthly Weather Review, Volume 80, Number 10, October 1952.

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Morales N., Héctor: **Evaporación,** [Evaporation], p. 6–16.
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Escobar V., I. and Harris, F. B., Jr.: **Asimetria de los mesones en el ecuador geomagnético,** [Asymmetry of the mesons on the geomagnetic equator], p. 31–63.

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Hanzawa, Masao: **Green flash observed in the Antarctic Ocean,** p. 139–140.

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Morandi, Luis: **Sintesis de las caracteristicas fundamentales del clima del Uruguay,** [Summary of the basic features of the climate of Uruguay], p. 197–207.

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Lagarmilla, Roberto: **Las rayas telúricas del espectro solar,** [Telluric rays of the solar spectra], p. 284–292.

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Hernández, Haydée: **La media aritmética y su aplicación en climatología,** [The arithmetic average and its application to climatology], p. 302–308.

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